American Machinist
Volume 59 NEW YORK, SEPTEMBER 27, 1923 Number 13

Is Beauty an Important Factor in Machine Design?

By K. H. CONDIT
Editor, *American Machinist*

The views of Mr. Maxfield Parrish, artist, machinist and draftsman, as expressed in a recent interview in the shop under his studio at Cornish

PROBABLY the factor receiving the least consideration in the design of almost any piece of machinery is that of beauty. Generally speaking, both builder and user are apt to consider that the product is satisfactory if it does its work well. There can be no question that the performance factor is the most important one in judging the quality of most mechanical contrivances. Yet there are other factors to be thought of and beauty of design is one of them.

In this day of specialization when one wants information on a question that is outside of his own experience he naturally consults an expert. Consequently our first thought when the question of beauty in machinery was put up to us, was of the only man on our subscription list, and probably in the country, really qualified to give an expert opinion on such a subject. Everyone is familiar with Mr. Maxfield Parrish as an artist but few know him as a machinist, a bent that is not surprising when one remembers that he is a great nephew of the famous Sellers' of Philadelphia.

A CORNER OF MR. PARRISH'S MACHINE SHOP

Mr. Parrish's home, studio and shop are located in Cornish, N. H., just across the Connecticut River from Windsor, Vt., traditional cradle of creative machinists for generations. The buildings are on a high hillside that commands one of the most superb views I have ever seen. His machine shop is beneath his studio and one of his problems has been how to eliminate the vibration of the studio floor set up by the countershafts hung below it. The tools themselves are set on concrete supports that run down many feet to the rock underneath the building, but the lathe countershaft which is directly under the place where he stands to paint sets up a disconcerting vibration when one of his boys starts to do a little turning job. The neatness of the shop and its orderly arrangement prove that its owner is no amateur mechanic.

So much for Mr. Parrish's qualifications and surroundings. Now for his expert opinion.

He maintains that there is a close relationship between the artist and what he calls the "creative machinist" to distinguish him from the unimaginative machine operator. Each must have a pictorial imagination. In other words, he must be able to visualize his work before a start is made toward constructing it. One difference between them is that they work with different media, the artist with paint and brushes or canvas, the machinist on metals with tools of more or less complexity. Another is that where the artist by his picture strives to convey his message to the souls of men through the medium of their eyes, the machinist is endeavoring to produce a mechanical masterpiece that will lighten men's burdens by doing their work for them.

If we grant the correctness of Mr. Parrish's claim that machinists are artistic, as I think we must, doesn't it follow that they should be rather susceptible to beauty of design in the tools with which they work? And if we concede the logic of this reasoning, isn't it worth while to pay some attention to balance, to symmetry, to proper proportioning of parts—in other words, to beauty—when we are designing machines to sell to men with such sensibilities?

If you are dubious on this point pick up several machine tool catalogs or run through the advertising pages of the *American Machinist*. Without knowing anything of the capabilities or workmanship entering the construction of various machines of the same gen-

eral type, you will still find that it is not hard for you to select the one which appeals to you as the best machine. Mr. Parrish has in his shop a tool which he cites as an example to prove this ability to recognize artistic merit in a machine tool. It is a twenty-inch drill press of a well known make. He has no fault to find with it as a maker of holes but he maintains that there is something wrong with its proportions. The twenty-four-inch model of the same machine is a much better balanced tool, he insists, and one that he would select in preference to the other every time.

Making the First Selection

Many a purchaser of machine tools picks out from the editorial or advertising illustrations of such magazines as the *American Machinist* the few tools of a given type from which he will make his final selection. Of course, this preliminary selection is only the first step in the narrowing down process which eventually results in the placing of an order, but it would seem to be a wise precaution to design a machine with sufficient attention to appearance to prevent its being eliminated from consideration in the very first test.

If beauty is to be accounted a desirable factor in the design of a machine how are we to know when we have achieved it? What criterion can be set up which will determine unerringly whether a new machine meets our requirements in this direction? Here we have a question that is difficult to answer.

Mr. Parrish has ideas of his own on this subject. He contends that Jay Hambidge's treatise on the subject of beauty is entirely sound although he feels that Mr. Hambidge has rather complicated matters by reducing his theories to mathematical formulas. Mr. Parrish says that the average artist has not the mathematical knowledge to follow formulas or understand them and he threatens to work out the same formulas in such a simple form that they can be demonstrated by means of two pins and a string. According to Mr. Parrish all Euclid can be worked out this way.

He believes that there is a natural law of right proportioning that runs through everything, enabling us to say without hesitation that one horse is more beautiful than another or that one lathe is more attractive than another. He also believes that some objects are intrinsically ugly. To bring out his position on this point he told of an argument he had just had with two artistically inclined college women. They tried to prove to him that a cow could be as beautiful for a cow as a horse is beautiful for a horse. Although they employed every bit of logic they possessed he remained stubbornly convinced that a cow is an unfortunately designed animal and cannot be considered beautiful by any stretch of the imagination.

On the other hand, there are certain things that are intrinsically beautiful. Greek temples fall in this class and so do sailing yachts. Neither one conforms to the other nor to anything else, yet we know instinctively that here is real beauty of line and proportion. To prove this nonconformity Mr. Parrish cites the attempts of machine designers of the early days of machinery to adapt the Greek column to their supporting members.

The Greek column is naturally beautiful, perhaps because when we look at it we have not the slightest doubt that it is proportioned to carry the load placed upon it. Used as a leg for a lathe or as a support for a walking beam of an engine in surroundings entirely foreign, it loses its beauty and detracts from the general appearance of the assembly to which it has been added. The Sellers' were among the first to realize that there was something wrong with this attempt to combine unrelated elements in a structure. Their machines were therefore the first to show the simplicity of line and the satisfying strength of proportion which brings true beauty to such a structure.

Mr. Parrish has a high regard for the English designers of locomotives and steamships. He recalls the work of the department which was intrusted with the careful study of line and proportions of locomotives in English locomotive shops. The engine of one crack train was finished entirely in yellow enamel, rubbed down. It may be that these old artistic designers carried things a little too far, for they certainly paid scant heed to the comfort of the engine driver whose well-proportioned cab was so short that he had to stand the full length of his run.

The same care in selecting proper proportions is evident in English steamers which have a beauty lacking in both France and American ships. Mr. Parrish maintains that even the English tugs have their stacks placed just right, and of a diameter and rake that show consideration of looks.

When it comes to such modern locomotive vehicles as the automobile, Mr. Parrish is rather severe in his criticism of their lack of beauty which has been sacrificed to style. He compares the present-day touring body to a chopped-off rowboat. In the early days of the automobile it was simply a carriage with a motor hung on at the least accessible point. Then as the motor car became established in public favor its designers and builders awoke to the fact that it was not a horseless carriage but a transportation machine. They stopped trying to follow the well established styles of horse drawn carriages and began to develop individual designs, some of which were really beautiful. Then came the stage of imitation where the smaller fry copied what their more successful competitors developed and finally the craze for style which has brought cars that are as unpleasing to look at as they are uncomfortable to ride in with their low seats that bring the occupant's knees level with his ears. In such machines as motor cars, where the most potent selling appeal for a large part of the purchasing public lies in the appearance of the machine, it would certainly seem that particular attention should be paid to beauty of design.

Beauty Indicates Right Proportioning

The whole thing, as Mr. Parrish says, comes down to this. Beauty in a machine tool, or in any other mechanical contrivance, very often indicates that the weights of the various parts have been perfectly proportioned to the strains they have to withstand. Consequently, it is not unreasonable to expect that such a product will perform more perfectly than one which is not so well balanced. The designer, to be successful in securing this perfect balance in his design, must have an unconscious sense of beauty or proportion. Perhaps, some day, we shall discover the law of natural beauty and it will then be possible for the designer to apply mathematical rules to secure it. Until that day comes, however, he must depend upon his innate artistic sensibilities with the comforting assurance that if he is successful in expressing them in his design, the result will be a machine successful mechanically, artistically and commercially.

Development of Machine Tools in New England

BY GUY HUBBARD

The sixth article—Special machines built for manufacturing rotary pumps—Development of the interchangeable system — Advanced sales methods — Working with convict labor

ASAHEL HUBBARD built the first wooden model of his revolving hydraulic engine at his "watermill" near the West Parish of Windsor, and after some experimenting he built one of cast iron, doing most of the work by hand, as he had but little machinery available. The teeth of the bucket wheels of this first pump were shaped by chipping and filing, being afterward ground in with powdered glass and oil.

On account of the lack of the necessary mechanical

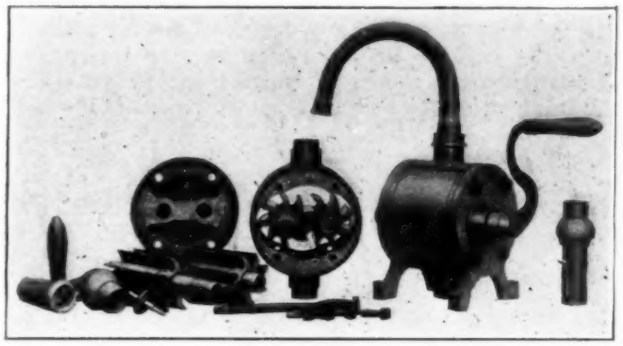


FIG. 30—ONE OF THE ORIGINAL HUBBARD PUMPS

equipment for the quantity manufacture of the revolving hydraulic engine at Windsor, and because both the local capital and local public interest were all tied up in the similar Cooper invention, Asahel Hubbard journeyed to Proctorsville, Vt., some twenty miles across the mountains west of Windsor, and interested Jabez Proctor in the proposition. Jabez Proctor (1780-1839) manufacturer, capitalist, politician and one of the most honored and influential men in the State, was born at Westford, Mass. He came to Vermont at the age of three with his father, Capt. Leonard Proctor, a Revolutionary officer who founded the village of Proctorsville in the wilderness of the township of Cavendish.

Mr. Proctor installed Ashahel Hubbard, temporarily, in the machine shop of his mill on the Black River in Proctorsville village, and on Oct. 28, 1829, they incorporated The National Hydraulic Co., with a capital of $50,000. This was the beginning of the chain of machine industries which, through various changes of name, has existed unbroken at Windsor for more than ninety years and through which has always run a strong community spirit. In these industries there have been developed some of the most important improvements in the mechanic arts and some of the greatest American mechanics, and from them have sprung no less than thirty other American industries, many of which are leaders in their field today.

Redfield Proctor, son of Jabez, was the founder of the Vermont marble industries at Rutland and Proctor, in the mechanical development of which he was greatly aided by another famous Windsor mechanic, Albert Ball, whose work will be taken up later on in considerable detail.

THE FIRST STATIONARY STEAM ENGINE

The special machines for manufacturing the revolving hydraulic engines and a few of the earliest engines were built at Proctorsville. In a short time Mr. Proctor, through his political influence, succeeded in having Asahel Hubbard appointed warden of the Vermont State Prison at Windsor, at the same time getting the authorities to install a steam engine (with the exception of that on board Thomas Blanchard's steamboat "Vermont," the first in Windsor) and a machine shop at the prison. In 1830, The National Hydraulic Co. removed its machinery from Proctorsville and located in this shop, beginning there the quantity manufacture of the revolving hydraulic engines by the interchangeable system and under a peculiar labor condition. One of the original pumps and some of its parts are shown in Fig. 30.

The manufacture of machinery under this so-called interchangeable or American system consists in making every part of each machine exactly like the corre-

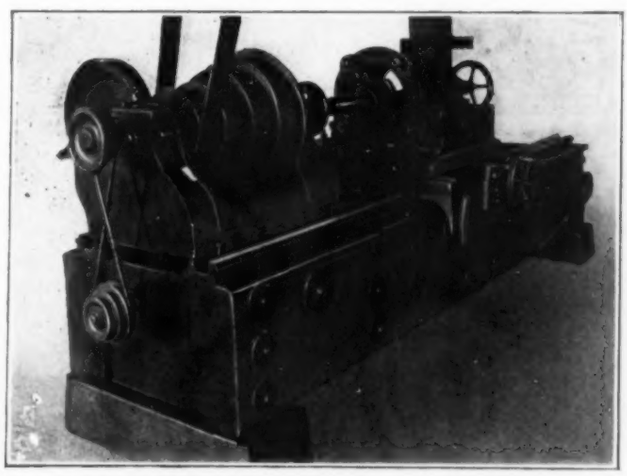


FIG. 31—BELT-FEED ENGINE LATHE, BUILT BY ALVIN JENKS, PAWTUCKET, R. I., ABOUT 1833

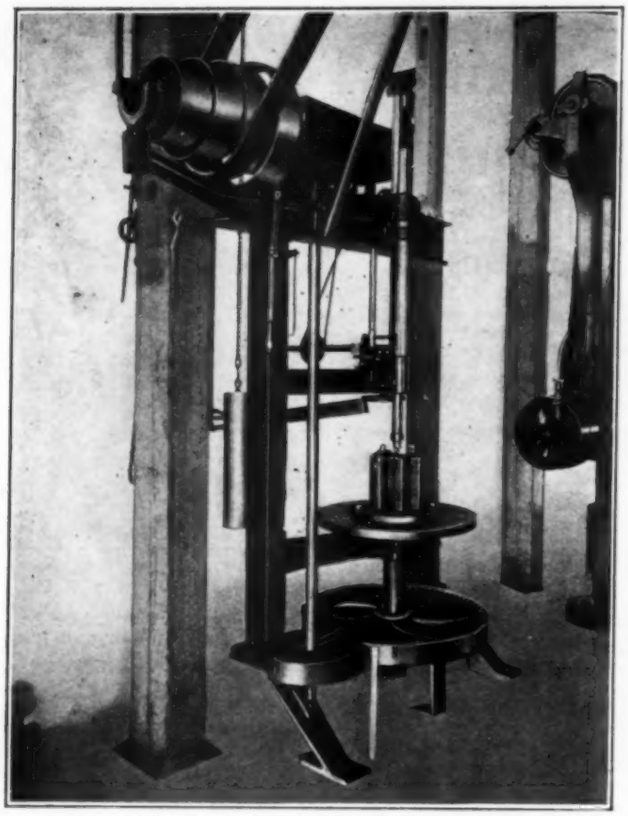


FIG. 32—BORING MILL AND DRILLING MACHINE, BUILT BY ALVIN JENKS, PAWTUCKET, R. I., ABOUT 1833

sponding part in every other machine of the same class and size, so that in assembling the parts no fitting is necessary, by reason of which repair parts can be furnished that will go directly into place. To build machinery upon this plan, it is necessary to either make very careful measurements during every stage of the production of each piece (the tool-room method) or to fit each piece to accurate gages, the drilling and shaping being controlled by accurate work-holding and tool-guiding devices called jigs and fixtures (the manufacturing method). The tool-room method is applied only to small lots of parts such as the jigs and fixtures themselves. In the manufacturing method the skill of the toolmakers who built the jigs, fixtures and gages is reproduced again and again upon the parts for which they are used; the "transfer of skill" it is called by Prof. Dexter S. Kimball in his "Principles of Industrial

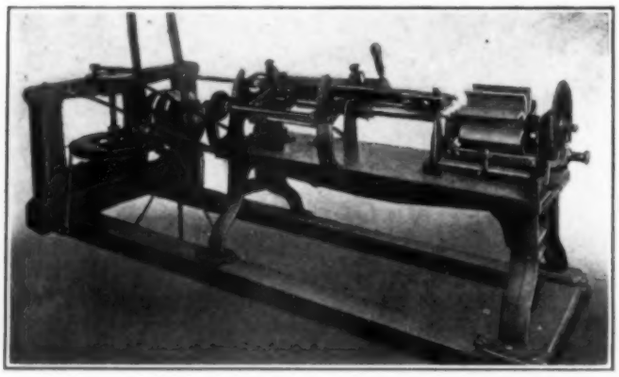


FIG. 33—CRANK PLANER FOR PLANING ROTARY-PUMP BUCKETS, BUILT BY ALVIN JENKS, PAWTUCKET, R. I., ABOUT 1833

Organization." Thus the keynote of the interchangeable system is *accuracy*.

The interchangeable system was projected by the armorers in France as early as 1717, but as late as 1785, the attempt of the gunsmith LeBlanc to build muskets by this system did not prove entirely successful, partly on account of lack of funds. The work of LeBlanc came to the attention of Thomas Jefferson, then Minister to France, and being himself mechanically inclined it interested him greatly. In fact he wrote to John Jay and to James Monroe of the possibility of applying the LeBlanc system at the United States Armories. Although he made some moves toward sending the inventor to this country, the matter lapsed at the time but very likely this agitation influenced the later backing given to Whitney by the Government.

Interchangeable Manufacture Abroad

Tackle blocks for ships were made at the Navy Yard at Portsmouth, England, by something approaching the interchangeable system about 1791, by Samuel Bentham (brother of Jeremy Bentham, the great prison reformer) and by Sir Marc Isambard Brunel (who during his exile in America came close to Vermont when he built the Hudson-Champlain Canal). Then in 1806, John George Bodmer, the famous Swiss mechanic, began to manufacture guns by special machinery at St. Blaise in the Black Forest, but in neither of these projects did the system exist in any degree of completeness.

It was in 1798 that Eli Whitney, the inventor of the cotton gin, accepted a contract for 15,000 United States muskets of which he proposed "to make the same

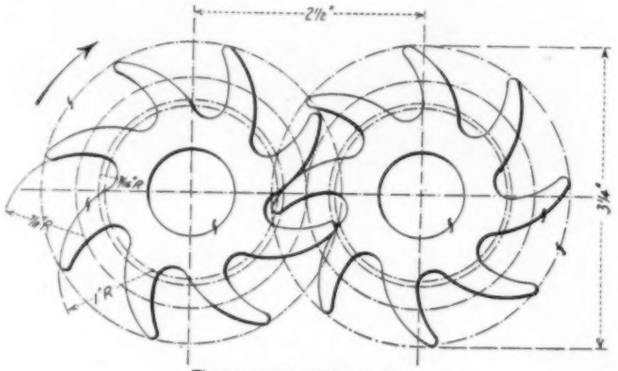


FIG. 34—DIAGRAM OF BUCKET WHEELS OF HUBBARD'S ROTARY PUMP, 1828

parts of different guns, as their locks for example, as much like each other as the successive impressions of a copper-plate engraving." In 1800, Whitney built and equipped his armory outside of New Haven and of his work Jefferson said in a letter to Monroe in 1801: "He has invented molds and machines for making all the pieces of his locks so exactly equal that take 100 locks to pieces and mingle their parts, and the 100 locks may be put together by taking the pieces which come to hand." Thus was this system first completely practiced at Whitneyville, Conn., and became known as the American system. It has since spread to all parts of the world.

Although the interchangeable system had thus early been applied to the manufacture of firearms (where its value was self-evident), its application to machine building did not immediately follow and the revolving

hydraulic engine was unquestionably one of the first instances in which it was applied in this connection. Upon the early application of this system and its subsequent development, rests not only much of the success of the Windsor machine builders (who, with the exception of Eli Whitney, in the early days probably did more to develop and spread this system than any others) but also that of American industry in general.

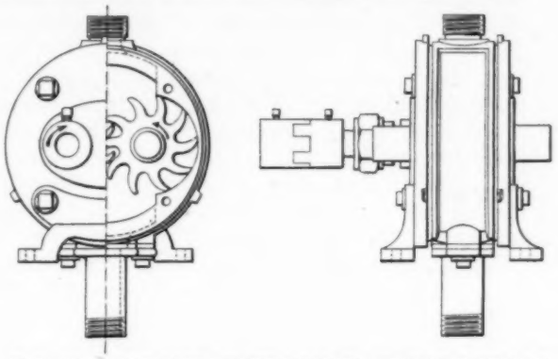


FIG. 35—DIAGRAM OF HUBBARD'S ROTARY PUMPS FOR HOUSEHOLD USE

The experiment in regard to labor at the prison touched both the free mechanics and the convicts who were employed by The National Hydraulic Co. The life of a mechanic in those early times of twelve-hour days and "bound-out" apprentices was not a rosy one, and the life of a convict in the days of damp cells, balls and chains, and whipping posts was much less so. The National Hydraulic Co., however, began to treat its free workmen, not like servants, but as fellow craftsmen and it made a special effort to send out its convict labor with self-respect and with a useful trade learned. At the same time the prison became a source of revenue to the State, instead of being a drain upon it.

Early Office Systems

The old books of the National Hydraulic Co., which are in the possession of the writer, show that it had excellent "systems," much like those used today in machine shops. List of jigs, fixtures, patterns, castings, operations, etc., were kept, as well as a record of each pump manufactured, showing its number (which was stamped upon all its parts), its test results, and to whom it was sent. All letters and orders were copied and filed. Quite accurate time was kept on the work in the shop, from which costs were figured, and records were kept of the quality of the work done by the various men. Entries in these ancient books show that when the more efficient convicts were pardoned or otherwise released, they were either kept on as free men or were fitted out with tools, new clothes and recommendations, so that they could start life anew elsewhere as useful citizens.

An apprenticeship system was also developed, by which likely boys were taken in at what was then a fair living wage ($100 per year and board) and were taught all branches of the business during a period of three years. These points go to explain why, years later, the workmen in their turn stood by the Windsor industries during periods of depression, for it is not beside the point to say they felt much the same toward these industries as graduates of a modern engineering college feel toward their *alma mater*.

The National Hydraulic Co. built pumps and fire engines, ranging from small cast-iron, brass or pewter hand pumps, to industrial pumps of more than a thousand gallons per minute capacity. The several small pumps which are still in existence prove them to have been strictly interchangeable. Following distinctly modern policies, the company began extensive advertising and sent salesmen out from Windsor who penetrated even as far as Northern Mexico. It also established agencies in all parts of the country.

The First Water Works

In 1829, Mayor Daniel D. Page and the Board of Aldermen of St. Louis, set on foot a movement to build the first water-works for that rapidly growing city and a firm of contractors, Wilson & Fox, undertook the work. Through Charles Manser, its agent at St. Louis, The National Hydraulic Co., in 1830, was given an order to build a revolving hydraulic engine of 20 hp., capable of raising water from the Mississippi and forcing it through 1,300 ft. of iron pipe into a 230,310-gal. reservoir. The reservoir was located on top of one of the mounds on the east side of what was later called Broadway, near the residence of Gen. W. H. Ashley, and was 104 ft. above the normal level of the river.

This "huge pump" was built at once and under the direction of the inventor was taken to St. Louis, being transported by wagon over the Green Mountains at Albany, by canalboat from Albany to Buffalo, by lake steamer from Buffalo to Chicago (then only a small settlement) and by wagon and riverboat from Chicago to St. Louis. This journey lasted for several weeks

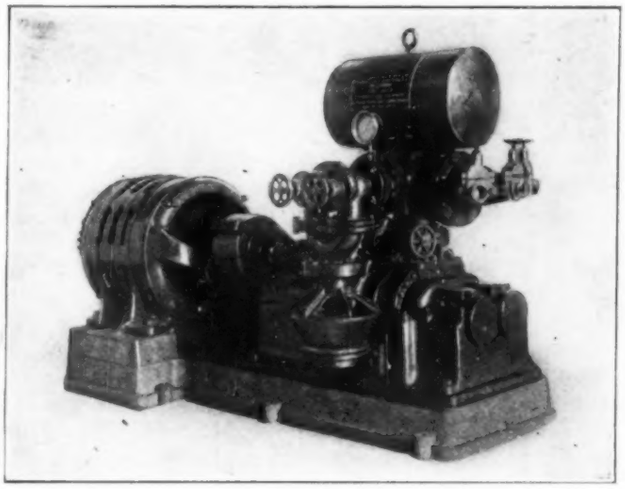


FIG. 36—A 750-GAL. HUBBARD ROTARY FIRE-PUMP, FALES & JENKS MACHINE CO., 1917

but both the inventor and the pump arrived safely at the then "far western" city. Under Asahel Hubbard's direction the pump was attached to a steam engine built by Francis Pratt of Pittsburgh and coupled to the mains which had been cast by Vanleer & Co. and Woods, Stacker & Co. at their iron works in Tennessee.

The pump worked very satisfactorily, but when it came to settling the bill, it was discovered that the water company did not have sufficient money on hand to pay for it. A committee of citizens, forerunners of the very progressive St. Louis Chamber of Commerce, then took up a collection but still there was a deficit, so these patriotic citizens presented the inventor with a fine, pure-white saddle horse. Asahel Hubbard, who was by that time anxious to return home, was glad to

accept this as payment of the balance. Taking the cash in gold in a money belt, he rode the horse to Davenport, Iowa, where he had other business and from there he and the horse journeyed back to Windsor by the same route and method by which he had gone west. His arrival in Windsor on his St. Louis horse was an event long remembered by the old residents.

The revolving hydraulic engine remained in use at the St. Louis Water Works, with another type of pump later added, until 1848, when it was replaced by a new steam pump of 150 horsepower.

Orders from Far Off

The National Hydraulic Co. began to receive orders from all over the country, a large order coming from far-away Matamoros in Mexico, and about fifty men, some convicts and some free, were employed. After the St. Louis trip, Asahel Hubbard spent most of his time traveling, going to all parts of the country from Canada to western Florida in the interests of the business. When away he left his son Colman, who had learned the machinists' trade under him, in charge of the prison and of the shop at Windsor.

On account of the difficulty of shipping large pumps from Windsor, the inventor, in 1833, sold his patent rights for the State of Rhode Island to David G. Fales and Alvin Jenks, who in 1830 had founded a machine business at Central Falls under the name Fales & Jenks. Mr. Jenks, a brilliant mechanic himself, was a member of a famous mechanical family and a descendant of Joseph Jenks of Hammersmith, England, who settled in Lynn in 1642 and who was, according to Lewis in his "History of Lynn," the first founder who worked in brass and iron on the "Western continent." Fales & Jenks, who had begun by building cotton machinery, immediately made Hubbard's patent rotary pump a prominent article of its manufacture, especially in the form of stationary fire-pumps for large buildings. After ninety years, the Fales & Jenks Machine Co. continues to build them in sizes varying from small bronze chemical pumps driven by hand, up to huge electric fire-pumps of a thousand gallons per minute capacity. The design is practically unchanged and it is now one of the oldest mechanical products continuously built by one concern in the United States. In the plant at Pawtucket may still be seen, in running order, some of the machines built by Alvin Jenks in 1833, which will give a clear idea of those used by The National Hydraulic Co. in the pioneer days at Windsor.

Special Machinery

One of these machines is a heavy engine lathe for boring the pump cases, shown in Fig. 31. It has a massive wooden bed with cast iron ways bolted to it and is fitted with a reversible carriage having a rack feed, operated by an ingenious endless belt arrangement on the front of the bed. The boring is done by an adjustable tool, held on a bar between the lathe centers and the cases are held in a fixture in which they can be quickly shifted by means of a slide, so that first one side and then the other may be bored at one setting.

Another ingenious machine is a combination boring mill and drilling machine, Fig. 32, which was designed primarily for boring the centers of the cast bucket-wheels for the steel shaft (an improvement in construction introduced in the pumps by Mr. Jenks). This machine is used as a boring mill by fixing the spindle with a sliding key and throwing the table into gear so as to revolve. As a drilling machine, the table driving-gear is thrown out of mesh, the table clamped in place and the key removed from the spindle, which is then thrown into gear. This machine has a speed-changing gear box and an adjustable power feed.

The third machine of this historic group, is a gear tooth generator for automatically shaping the rolling faces of the teeth of the bucket wheels, see Fig. 33, upon the accuracy of which the efficiency of the pump so greatly depends. In 1828, planers and milling machines were very rare in New England and probably had been scarcely heard of in Vermont. Plane surfaces, or special curved surfaces which could not be cut in the lathe, were produced by chipping and filing, just as were the teeth of Asahel Hubbard's first cast-iron bucket wheels. In fact the special machinery by Mr. Jenks was built by this method, the labor of chipping and filing (which by the way is almost a lost art among mechanics) being reduced to a minimum by providing raised "spottings" upon the castings where the plane surfaces were required. One of the first special machines built by the National Hydraulic Co. was a sort of hand planer in which the cutting tool was guided by a form to follow the curve of the tooth as it made its progressive strokes. As is the case of most early gearing, the tooth curve of the bucket wheels of these pumps was an arc of a circle which approximated the true epicyloidal form, as shown by the accompanying diagram, Fig. 34.

Planer with Forming Attachment

Alvin Jenks greatly improved this planer by making it power driven, by relieving the cutting tool on the back stroke, by providing a power feed with automatic stop and by making the machine adjustable to different sizes of bucket wheels. This machine, which Prof. Joseph W. Roe believes to be the original gear tooth generator, is primarily a crank shaper, with the ram sliding upon a round rod and about which it is also fitted to swing. The radius of the swing is adjustable by raising or lowering the slide by screws, and the swing or feed is controlled by pinions meshing into quadrants fastened to the body of the slide. The pinions are turned step by step by a ratchet wheel, which is kicked by a dog on the toolslide at the end of each return stroke, the motion of the ratchet wheel being communicated to the pinion shaft by bevel gears. This mechanism is adjustable for coarse and fine feeds. The bucket wheel is held between centers in an adjustable fixture having an index plate like a milling machine. The relieving of the tool is accomplished by a wedge, a sort of slide within the toolslide, which forces the tool up to the cut when the stroke is forward but lifts it slightly when the stroke is to the rear. Automatic stopping is provided by lifting a pin clutch in the drive mechanism, by a lever operated by an arm on the toolslide, when the toolslide has traveled through the required arc.

To operate the generator, a bucket-wheel casting which has been turned, bored and pressed on its shaft, is mounted in the fixture with the proper index plate in place. By means of a gage, the center of the gear-tooth arc is lined up with the center of the rod on which the toolslide moves and the radius of swing of the tool is set to the radius of this arc. With the tool beginning to cut at the bottom of a tooth, the machine is started, and at each return stroke the tool moves a step toward

the top of the tooth, gradually swinging on the proper curved path. When the tooth is completely planed, the machine automatically stops, the operator indexes the gear to another tooth, sets the toolslide back and starts the machine. This cycle of operations is repeated for each tooth, the operator meanwhile tending to other machines.

Although the Fales & Jenks Machine Co. has a complete equipment of modern machine tools and cuts the teeth in its standard pumps in a powerful milling machine with formed cutters, these ancient machines are by no means idle, being frequently called into service to make repair parts or during the construction of special pumps. As there was no general public water supply in Providence until subsequent to 1870, hundreds of the small pumps such as shown in the diagram in Fig. 35, were sold to the householders of that city to draw water from wells and cisterns. Of late years, The Fales & Jenks Machine Co. has developed automatic electric fire-pumps for large buildings, the largest of which, Fig. 36, will deliver a thousand gallons per minute for high-pressure fire service. From its original and somewhat sacrilegious test upon the steeple of the South Meeting House in Windsor Village in 1828, Hubbard's Rotary Pump was developed under Fales & Jenks, to a point where it threw a powerful stream almost to the pinnacle of the Tribune Building in New York City, in a test made some fifty years later.

Practical Notes on Speeds and Feeds

By Ernest K. Steiner

IT HAS been my experience to find that only a small percentage of job-setters and foremen really know how to check the speed and feed of the machinery over which they exercise supervision.

For convenience we will use the term "Surface Speed" to designate what is variously called surface speed, peripheral speed, rim speed, cutting speed and circumferential speed. Surface speed is the number of feet on the surface which passes a given point in one minute and on a lathe, where the work is revolving, it is the number of feet of surface revolving past the tool. On a milling machine, where the cutter revolves, the surface speed of the cutter is taken.

For a circular object revolving about a center, the surface speed is found by multiplying the circumference of the object in feet by the r.p.m. of the machine. The circumference in feet is found by multiplying the diameter in inches by 3.1416 and dividing by 12, which gives the following formula:

$$\text{Surface speed} = \frac{\text{Diam. in in.} \times \text{r.p.m.} \times 3.1416}{12}$$

$$= 0.2618 \times \text{diam. in in.} \times \text{r.p.m.}$$

The more important elements which determine surface speed are the kind of material being machined, the type of machine being used, the condition of the machine, the kind and amount of cooling liquid available at the surface of the work, the kind and condition of the tool, and the amount of cut being taken. The table of surface speeds herewith has been compiled through years of experience and the data is given for high-speed tools with the exception of those designated in the note below the table. The grinding speeds were determined from wheels of various makes.

STANDARD SURFACE SPEEDS IN FEET PER MINUTE

Operation	Material						
	C. R. Steel	D. F. Steel	Cast Iron	Mall. Iron	Alum-inum	Brass	Bronze
Drill	120	110	140	110	300	300	120
Grind	6,000	...	6,000	...	6,000	...	...
Gear Cut	100	100	125	100	.....	300	200
Mill	200	200	250	175	800	500	225
Profile	200	200	225	175	700	500	225
Turn	175	175	100-R *300-F	*190	1,000	250	175

* Stellite.

These figures represent standard surface speeds that should be used with ideal conditions prevailing, but condition of machine, lubrication, depth of cut, etc., also affect the speed and make it necessary at times to use a slower speed than shown in the table.

According to the table a surface speed of 300 ft. per min. should be used when finishing cast iron with a stellite tool on a lathe. Assuming that the work is 5 in. in diam., the proper r.p.m. can be determined by transposing the formula given above.

$$\text{R.p.m.} = \frac{\text{Surface speed}}{\text{Diam in in.} \times 0.2618}$$

$$= \frac{300}{5 \times 0.2618} = 229, \text{ approximately.}$$

If the diameter of the line shaft pulley is not great enough to give a sufficiently large r.p.m., a larger pulley should be placed and its diameter may be found as follows:

$$\text{Diam. of line shaft pulley} = \frac{\text{diam. of machine pulley} \times \text{r.p.m. of machine}}{\text{r.p.m. of line shaft}}$$

For instance, if a grinding wheel is to run at 750 r.p.m., has a 4-in. pulley, and is to be driven from a line shaft at 250 r.p.m., the diameter of the line shaft pulley required will be $\frac{4 \times 750}{250}$, which equals 12 inches.

The feed of a machine is equally as important as the surface speed but is of such a nature that it can not be tabulated, since the finish required on a piece governs the thickness of cut to be taken. Feed should always be given as a certain fractional part of an inch per revolution of work on cutter.

Practically all production machines have lead screws with plenty of adjustments for any desired feed, but if not, it is a comparatively simple matter to figure the gearing required between spindle and lead screw for a given feed.

Choosing Feed Gears

For example, assume that a feed of 0.0625 in. per rev. of spindle is required, and that the lead screw has 6 threads per inch. It is evident that the lead screw must make $\frac{6}{16}$ or $\frac{3}{8}$ rev. for one revolution of the spindle and this is, therefore, the gear ratio required. It is only necessary to choose gears whose tooth numbers have this ratio and in this case a 24-tooth gear would be placed on the spindle with a 64-tooth gear on the lead screw.

For drilling feeds, 0.004 to 0.007 in. per revolution will be satisfactory for drills under $\frac{1}{2}$ in. in diameter and 0.005 to 0.015 for the larger sizes.

Book Reviews

Engineering Kinematics. By William Griswold Smith, associate professor of mechanical drawing, College of Engineering, Northwestern University. First edition, 6x9 in., clothboard covers, 341 illustrations, 278 pages. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y. Price $3.

Here is a book which has a definite purpose in the field of engineering instruction, as it aims to tie up closely the theory of kinematics, which is the science of motion, with the actual practice of engineering. It is primarily a textbook, and its arrangement and general plan seem to make it well adapted for that purpose. For one thing, the use of illustrations in profusion, giving both diagrams of mechanical movements and views of machines employing the mechanisms, makes the book more readable and interesting. Then, also, the large number of problems given at the end of each chapter helps both instructor and student, as a great variety of questions of a practical nature is presented in them. Usually a typical example is worked out, as an aid to the student.

In the preface the author recognizes the tendency of recent books to combine the theoretical and the practical, and he says about his own volume, "while the fundamental principles of motion, its laws, its conversion, and its transfer, are given first consideration, the applications of these principles to the design of the innumerable agencies of transmission, transportation and production are given as much attention as the size of the volume will permit." In consequence, the author has used as the chief source of material for the work, not so much the textbooks as the large volume of industrial literature to be found in such works as catalogs and technical magazines. The material can thus be considered as largely first-hand.

It is reasonable to expect that the engineering touch to the work, and the illustrations taken from actual practice, will give the student a greater interest in the subject and bring home to him the importance of the science itself. A study of the science in the abstract is apt to be dull to a man interested in machinery primarily, and may not enable him to apply the principles. For this reason the book should be commended for teaching what can be done with a science, as well as explaining the science itself. The viewpoint is truly that of an engineer.

It must not be assumed that the theory has been slighted, as detailed explanations are given wherever necessary. Naturally, owing to the nature of the subject, the treatment cannot all be simple, and the study requires concentration on the part of the student. The text itself seems to be quite clearly and well written, although concise in the main. It should be sufficient to give the student a reasonably broad yet detailed view of the subject.

As for the scope of the work, a glance at the chapter headings might not be amiss. After a chapter on definitions and fundamentals, the properties of mechanisms are discussed. This latter material consists of explanations on the subjects of the determination of relative velocities and accelerations of simple linkwork parts; chains of linkwork; and direct contact pairs, rolling curves and friction transmission. Toothed gearing for both parallel and non-parallel shafts is then considered. After treating of cams, transmission by belt, rope and chain is discussed. The last chapter on chains of mechanism is followed by an appendix explaining a number of devices employed for controlling, regulating and adapting the standard mechanisms.

Lectures on Engineering Practice. Edited by John B. Whitehead. Published by the Johns Hopkins University, School of Engineering, Baltimore, Md. Paper binding, 90 pages, 6x9 in., price $1; illustrated.

In this little book Mr. Whitehead, dean of the Faculty of Engineering at the Johns Hopkins University, has gathered three lectures, given at the university during the past year under a general plan for furthering and improving undergraduate instruction in the methods and problems of the practice of engineering. One lecture each was given in the general subjects, Civil, Electrical and Mechanical Engineering, and they are authoritative, comprehensive and interesting. These lectures were open to the public, but Mr. Whitehead is to be congratulated for his endeavor to make them available to those who were not fortunate enough to hear them at the university.

For the Civil Engineering department, A. T. Goldbeck, Chief, Division of Tests, Bureau of Public Roads, was chosen to speak on the subject, "The Relation of Highway Research to Modern Road Construction." This lecture is not burdened with an overwhelming load of statistics, approaches the subject from the economic as well as the engineering standpoint, and traces the development of modern road building in a very instructive manner. The latest tests and up-to-date designs are discussed, together with the application of the knowledge gained to the practice of highway construction. The information will prove interesting, not only to the highway engineer but to all those who are interested in the development of good roads in this country.

Norman Wilson Storer, General Engineer, Westinghouse Electric & Manufacturing Co., spoke on "Possibilities for Steam Railway Electrification." A historical review of the development of the electric railway is given in which the important forward steps are explained in relation to the devices and discoveries which made them possible. Modern instances of railway electrification are clearly described and the possibilities for further development are discussed. Mr Storer handles his subject in a manner which lends authority to his words and clarifies the problem for one who is not fully conversant with all the details.

The Mechanical Engineering lecture was given by George A. Orrok, Consulting Engineer, the New York Edison Co. His subject was "Power Development—Past and Future." As is evident from the subject, this lecture traces the history of the development of power from the earliest times, not entirely from the standpoint of apparatus design, but more especially as regards plant efficiency and power costs. Mr. Orrok clearly explains the limitations of the steam power plant as regards further increases in efficiency and outlines the possibilities of future development.

To the average reader as well as the engineer, this book will be exceptionally instructive and interesting. All the lectures are well illustrated by means of diagrams and photographic illustrations.

A Recently Developed Automatic Screw Machine

BY SPECIAL CORRESPONDENCE

Unusual design of tool slide—Feed motion through worm gearing—Cam-operated cross slides—Four work spindles mounted in combination bearings—1¼-in. bar capacity and 6-in. machining and feeding length

AN INTERESTING development in the field of automatic multiple-spindle screw machines has been completed by the Detroit Automatic Machine Co., 12380 Wisconsin Ave., Detroit, Mich., and the salient features of the machine, as offered for manufacturing purposes, are shown in the accompanying illustrations. The aim of the development company has apparently been to secure simplicity of design and ease of operation, together with rugged and durable construction.

A front view of the machine is shown in Fig. 1, and illustrates the relative positions of the driving-head, tool-slide, cross-slide and work spindles. Fig. 2 is a rear view of the machine and shows the spindle cam, the work feeding device and other mechanism.

The constant-speed driving pulley, seen at the left in Fig. 2, is mounted on a shaft in the head which is geared to the shaft at the center of the machine. This shaft passes through the tool slide and drives the spindles in the revolving head. The pulley shaft is also geared downward to the feeding mechanism.

The tool slide, of rather unusual design, as shown at the center in Fig. 1, has a rack on its bottom surface which meshes with a pinion of small diameter and long face. As will be noted from the illustration, this slide is rectangular in section with comparatively large surfaces for the attachment of tools, and has its bearing directly on the top of the bed.

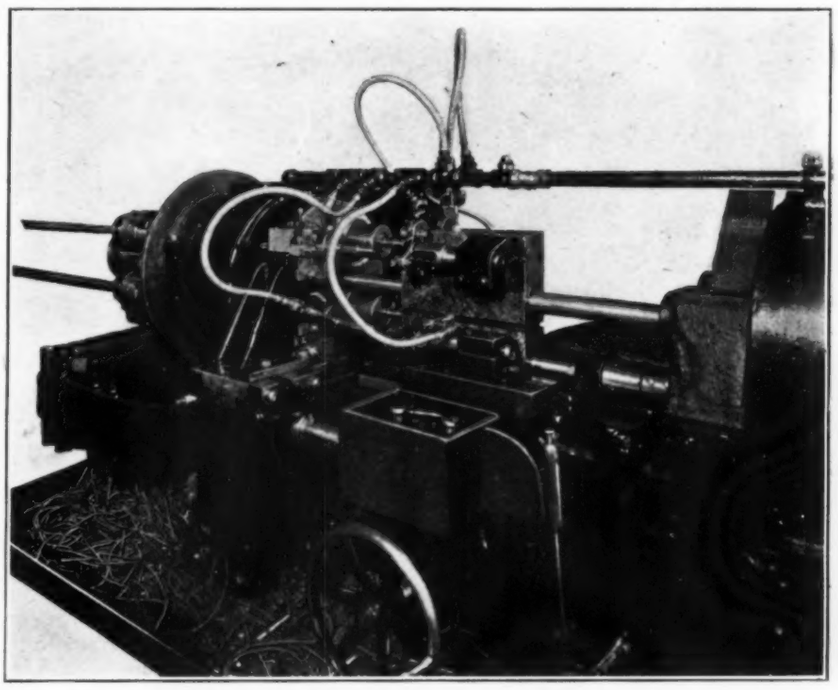


FIG. 1—FRONT VIEW OF THE DETROIT AUTOMATIC SCREW MACHINE

The feed pinion is on the same shaft as the worm wheel, shown below the driving pulley in Fig. 2, and another shorter shaft is geared to the worm wheel shaft by spur gears so that the two shafts run in opposite directions. A pinion on the second shaft also engages the rack on the tool slide. Some of the teeth on both rack pinions are omitted, and they are so timed that, after the worm wheel shaft pinion completes its function of advancing the tool slide, the second pinion, rotating in the opposite direction, engages the rack and returns the slide.

The tool slide, in its extreme forward position, is locked during a dwell period, which is provided to finish square shoulders, etc., on the work. It is also locked at its rearward position so that it will not lose its proper timed relation with the driving pinions.

The worm shaft is driven by a gear mounted in the head and driven from the pulley shaft. The drive from this gear consists of a pair of change gears for the fast return speed, and a planetary reduction arrangement for the slow feed. The worm is driven by these mechanisms through a clutch, which is thrown by a lever mounted on the bed and actuated by trip dogs on the worm wheel. One dog is fixed in position on the wheel and trips the clutch to the quick return speed at the end of the forward travel of the tool slide; the other is adjustable and engages the forward feed.

The feed change lever, although actuated by a spring and plunger, is arranged so as to be positively thrown into neutral if the spring on either side fails to function properly, so that the danger of jamming the tools into the work is guarded against. The worm is not driven directly by the feed changing clutch but through a slip-jaw clutch which is arranged to release under a heavy

load such as might be caused by the machine jamming in any way. This clutch may be thrown in and out of engagement by a starting and stopping lever at the front of the machine.

The bevel gear, shown at the right of the worm wheel in Fig. 2, is connected to a handwheel at the front of the machine, so that when the power feed is thrown out the feed may be operated by hand.

The brackets which support the cross-slides extend downward the full depth of the bed, and the slides are mounted in dovetailed guides, provided with taper gibs. Two take-up springs are provided on each slide as well as a positive return cam for safety.

The actuating cam for driving the cross-slide toward the work is located directly under the center of the slide and transmits motion to a roller mounted on a lever

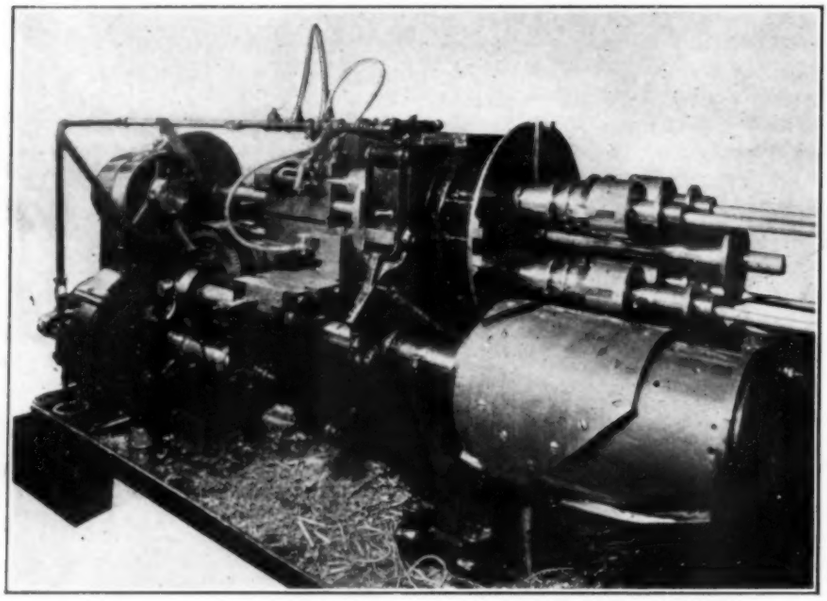


FIG. 2—REAR VIEW SHOWING CAMS AND REVOLVING HEAD

which has a toothed sector at its top. The teeth mesh with a rack on the under side of the slide and the fulcrum of the lever is at the lower end of the cross-slide bracket. Special cross-feed cams can be made for various jobs. The camshaft is geared to the worm wheel shaft previously mentioned.

The cross-slides are made wide and long to stand the thrust of wide forming tools, and are of sufficient length to permit the use of a so-called double-deck tool post as shown in Fig. 1. The cutting lubricant system is evident from the illustrations.

The housing for the four work spindles is a separate member, machined in halves and bolted into a recess in the bed. The spindles are machined from high-carbon steel and the center portion, upon which the drive gear is mounted, is of larger diameter. On each side of the gear flange a hardened and ground sleeve is fitted to the spindle and these sleeves provide the journals for the spindle, running in cast iron sleeves forced into the revolving head.

The spindles are driven by a helical gear on the center shaft previously mentioned. A ball thrust bearing and suitable adjustment is provided for spindle end thrust and both the drive gearing and thrust bearings are located inside the housing in an oil-tight compartment. In addition to the thrust and sleeve bearings, a radial ball bearing is located at the front end of the spindle directly behind the collet cap. It is claimed that the ball bearing will absorb the heavier shocks while the straight bearings prevent chatter, and that the arrangement gives a better bearing than the taper sleeve type.

The revolving head, which carries the spindles, is indexed by a Geneva-stop motion and the slotted intermittent plate of the device can be seen in Fig. 2. The Geneva crank is carried on the cam drum shown below the plate. The rectangular locking bolt for the head is located on the center line of the machine in Fig. 2, and is positively withdrawn by a cam. Two springs are provided to seat the bolt firmly in the notch when indexing has been completed. The notch or seat for the bolt has hardened steel sides which may be machined or replaced to correct errors in indexing. The locking bolt also has a taper gib for taking up wear.

The collet-closing and stock-feeding mechanisms are actuated by the cam drum on which the Geneva crank is carried. This drum is on the same shaft as the lock bolt cam and the rear cross-slide cam and is driven through bevel gears from the worm wheel shaft. The cams, which operate the collets, are fixed to the drum, but the cams which draw the stock feeding tube back preparatory to feeding, are removable. The cam which advances the feed tube is permanent.

The cam followers consist of two pairs of levers linked together at one end and pivoted at the other on the frame. The shoes which operate the mechanisms are mounted on these levers and are thus given a straight line motion without the use of the usual slides. Another advantage of this arrangement is that a leverage is provided so that the total force required to close the collet is not carried by the cam.

The stock feeding is not started forward until after the head has started to index and this arrangement allows the placing of the stock stop in such a position that the cut-off or fourth position is free from obstruction and available for such operations as threading, pointing or reaming. A spring is arranged in the feeding drive so that the feeding fingers will not be broken as sometimes happens at the end of a bar. The collet is of the stationary type and has a long bite with two grips arranged to move in a straight line against the work.

Development of Machine Tools in New England—Errata

In the first article there was an error in the geneological chart on page 2. In the center column near the top, the words native iron should have been native born.

In the second article, page 140, Samuel Morey is said to be from Oxford, N. H. This should have read Orford, N. H.

In the fifth article, in the drawing of Cooper's Rotative Piston (Fig. 26, page 390) the positions of the inlet and outlet should be reversed.

Plant Depreciation

By Hamish S. Reid
Upper Burma, India

IT IS of happy augury that of recent years engineers are showing more interest in the principles of depreciation. They realize that a knowledge of this continuous factor is essential and must be of an intimate nature if efficient planning and successful economies are desired. In modern days when rule-of-thumb methods and crude conventions are giving way to methods founded on investigation and experience, it rather behooves engineers to use in monetary calculations, speaking with regard to the plant, a similar degree of accuracy and exactitude to that which is used in workshop practice. Depreciation can no longer be ignored in estimates and shop mathematics. It is, one must realize, something real and actual, and it is of as much consequence to the engineer as it is to the financier and accountant.

Depreciation Defined

Depreciation of a plant may be defined as the diminution of value, due either to the physical effects of wear and tear, to the economic effects of obsolescence, or to both. The monetary provision allowed to make good, when necessary, the physical depreciation is termed "renewals," and provision for the economic depreciation, "improvements." The difference between these two funds must be clearly borne in mind.

The plant may perhaps possess the physical capacity to serve competently and constantly for a further duration of many more years but, due to pressure and influence exercised by trade competition, it must be scrapped for the substitution of another plant containing up-to-date improvements or economic advantages. Thus, while the renewals fund provides money for the plant to be replaced when worn out, disused, or scrapped, the charges made for improvements permit the utilization of advantages brought about by industrial progress and invention.

For adequate provision against depreciation the division of the charges made into the two above funds is important. The rate of decrease in value of a plant from the economical point of view will be moderately steady and constant but it will depend entirely upon the measure of industrial invention and advancement. From the physical point of view, however, the depreciation of a plant must be reckoned in units of work rather than in units of time or progress.

Depreciation Rates Vary

There is neither rhyme nor reason in asserting that a plant working at its top speed or stressed to its maximum capacity would depreciate at a rate similar to that of another plant lying in a state of rest or semi-rest. For both funds charges must be made accordingly. The improvements fund is substantially a fund for the use of the works management, for it is a fund through and by which this department can effect economies and improvements.

Depreciation primarily affects the engineer. It is his function not only to supply accurate data for the use of the financier and accountant, but he himself will need such information for his own shop and office calculations. The data that is required of the engineer concerns the present value, the life, the age, and the residual value of the plant, the ultimate aim being to accurately determine the annual charges. The extent of the annual charges cannot be arrived at by one estimate alone but only by a series of periodic examinations extended over a length of time, and by such treatment the results obtained, rather than being a matter of sheer haphazard prediction, are of practical use. All information collected should be systematically tabulated for future reference. Figures set down by manufacturers are at times not without bias and should, no doubt, be accepted with some discrimination and care.

Previous to the purchase of a new plant of any magnitude it is first necessary to decide, by taking into account the annual charges, which of two or more alternative plants will be the more economical. Depreciation being an annual charge must also be considered.

Let us consider two hypothetical plants as follows:

	Plant "A"	Plant "B"
Initial cost	£30,000	£22,000
Return on capital at 5 per cent	1,500	1,100
Renewals } Depreciation	1,300	1,800
Improvements } Depreciation	1,200	1,400
Operative expenses	2,000	2,400
Maintenance	600	750
Total annual charge	6,600	7,450

Thus, and this case is not untypical, the plant having the higher initial capital cost has the lower total annual charges which, extending over a number of years, will multiply into a large sum and amply justify the higher original outlay. By the substitution of the present value for the initial cost it may be determined what economies, if any, would be effected by the scrapping of the existing plant and the installation of the other.

Depreciation in an Oil Field

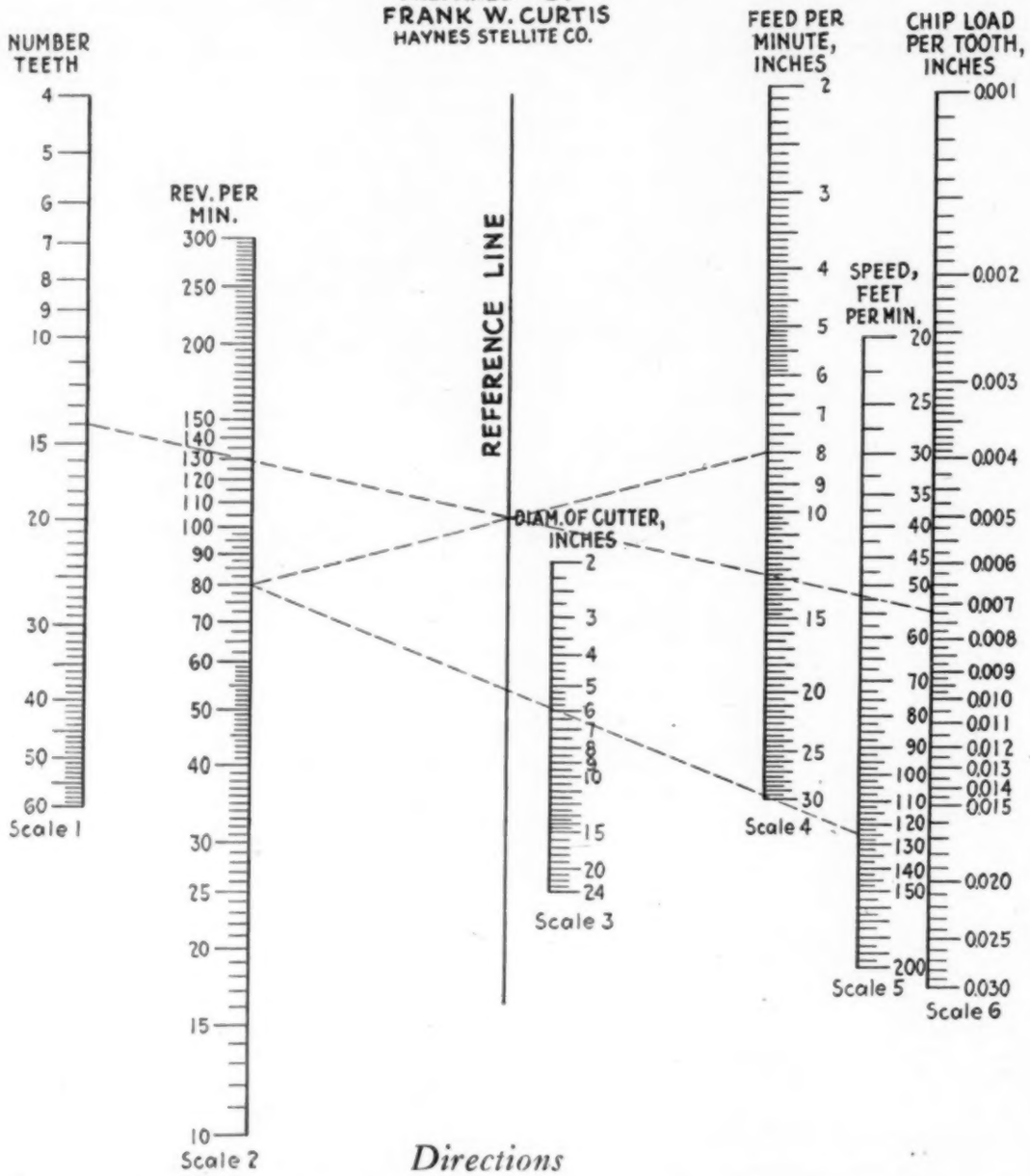
The author, in his position as constructional engineer in a large Eastern oil field, became strongly at variance with the method adopted in that field to value steel pipe. Upon the issue of new pipe to a well the system in vogue was to credit the well with the full value of the pipe. Later, upon subsequent withdrawal and removal from the well the pipe was valued at 90 per cent of its full value and, after being re-threaded, it was issued to another well as good and 100 per cent pipe. The above 10 per cent difference in value was debited against the well as charges for the use of the pipe and credited to the machine shop as "payment" for re-threading. This cycle of transfers continued until the pipe, either by wear or tear or by corrosion, became useless for drilling purposes. A final charge of 10 per cent of the first cost was then made against the last well and the remaining 90 per cent was credited to a scrap pipe account.

The above, apart from being an untrue and unfair allocation of cost, renders erections and constructions made from secondhand pipe prohibitive unless there happens to be a large amount of scrap pipe in hand. If a price proportionate to the condition of the pipe had been charged—for example 20 per cent—timber and such materials which actually are more expensive would not have had to be employed.

Depreciation enters, as it has been the endeavor of these few notes to demonstrate, into all engineering monetary calculations. A plant shrinks in value physically and economically and, until this is intelligently appreciated, satisfactory measures cannot be taken to avoid losses.

CHART FOR CALCULATING SPEEDS AND FEEDS OF SOLID AND INSERTED-BLADE · MILLING CUTTERS ·

PREPARED BY
FRANK W. CURTIS
HAYNES STELLITE CO.



Directions

(1)—To obtain table travel (Feed per Minute) connect the "Load per Tooth" Scale (6) with the "Number of Teeth" Scale (1). Then connect "R.P.M." Scale (2) through the point where the first line crosses the Reference Line, and carry over to Scale (4), which gives "Feed per Minute."

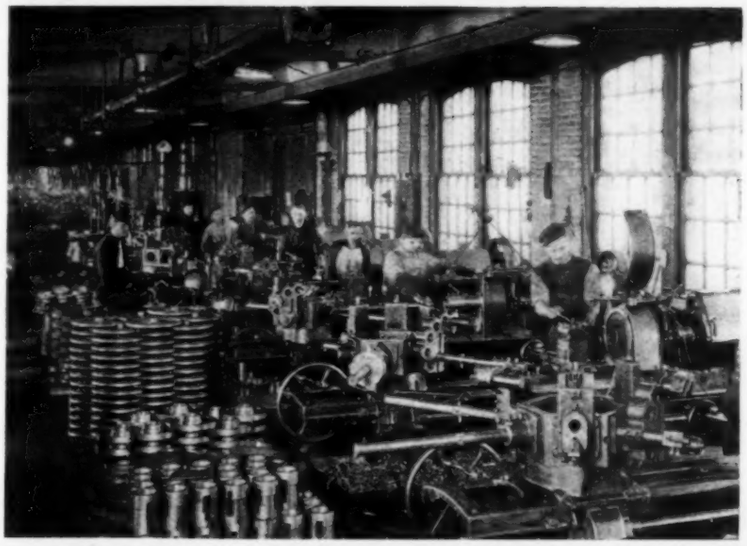
(2)—To obtain "Chip Load per Tooth" connect "Feed per Minute" Scale (4) with "R.P.M." Scale (2). Then connect "Number of Teeth" Scale (1) through the point where the first line crosses the Reference Line, and carry over to Scale (6), which gives "Chip Load per Tooth."

(3)—To obtain "Speed in Feet per Minute" connect "R.P.M." Scale (2) with "Diameter of Cutter" Scale (3) and read speed on Scale (5).

(4)—To obtain "R.P.M." connect "Speed" Scale (5) with "Diameter of Cutter" Scale (3) and read "R.P.M." Scale (2).

The chart is valuable for the following uses:

(1) Short cut for figuring speeds and feeds;
(2) For checking jobs in operation;
(3) For comparing operations (variations);
(4) For estimating purposes;
(5) For research work on milling cutters.

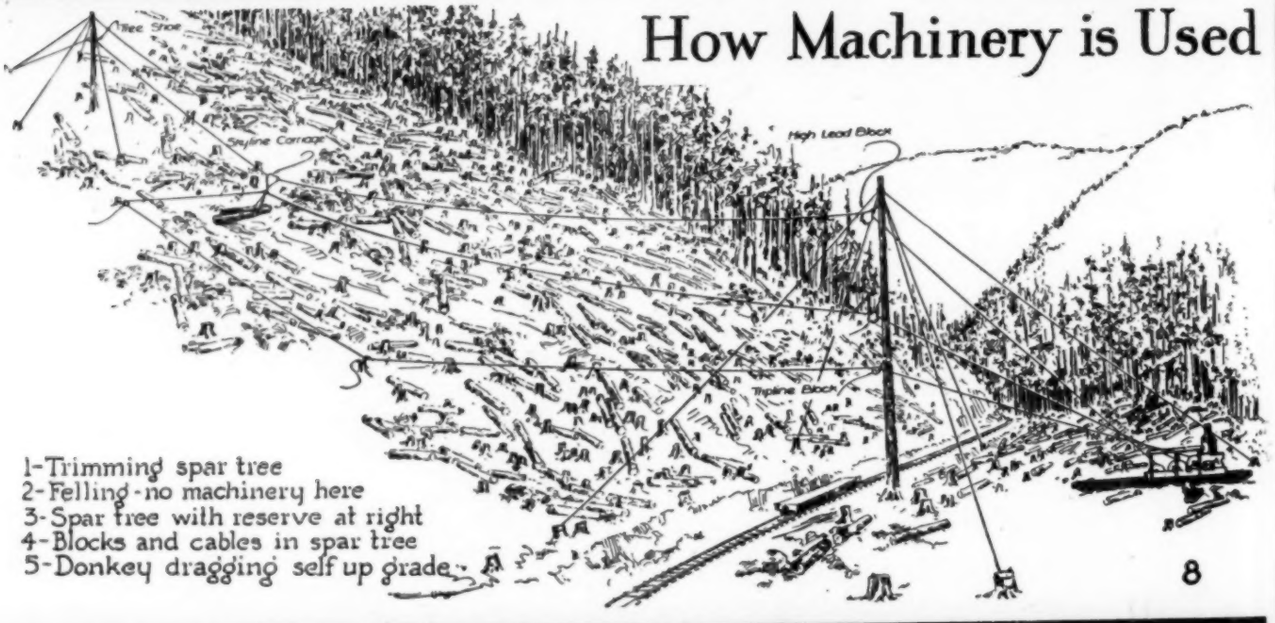


Where Machine Tools Are Made

The Warner & Swasey Company

Founded 1880

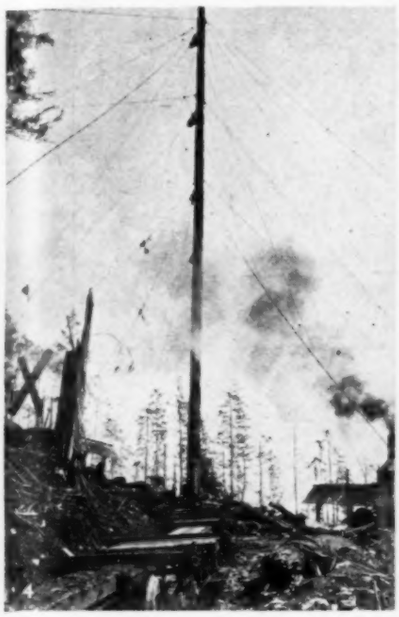
How Machinery is Used in

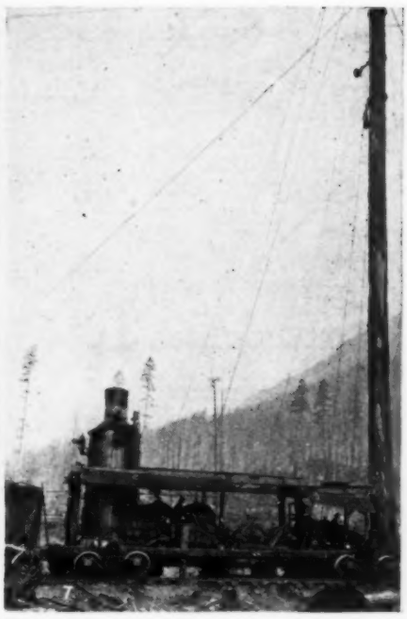


1-Trimming spar tree
2-Felling-no machinery here
3-Spar tree with reserve at right
4-Blocks and cables in spar tree
5-Donkey dragging self up grade

8

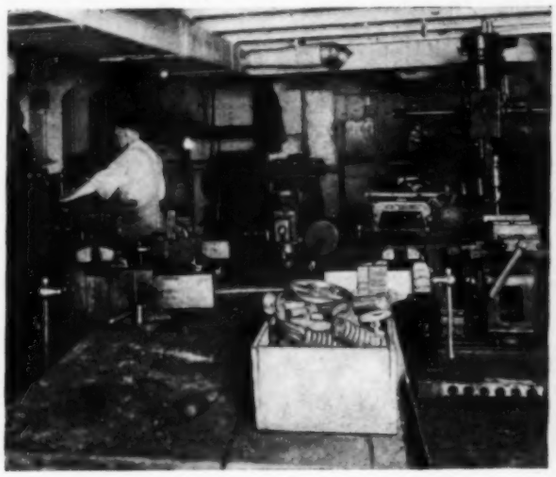
10





in Big Timber Logging

6 –Runway logs driven through tree
7 –Double engined yarder and loader
8 –Diagram of side hill work
9 –Handling timber over a hill
10 –When the job is done



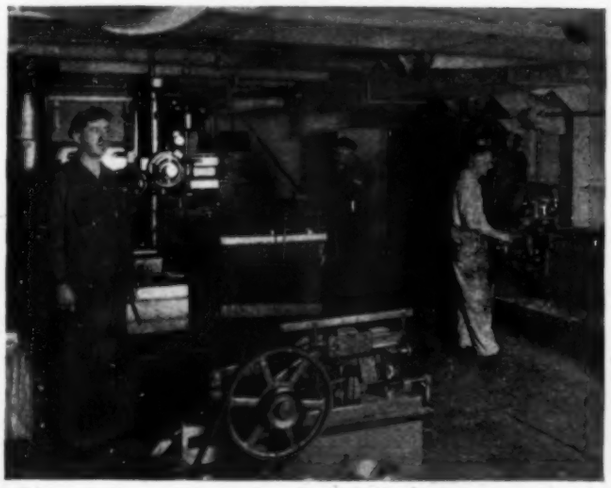
Machine Tools Afloat

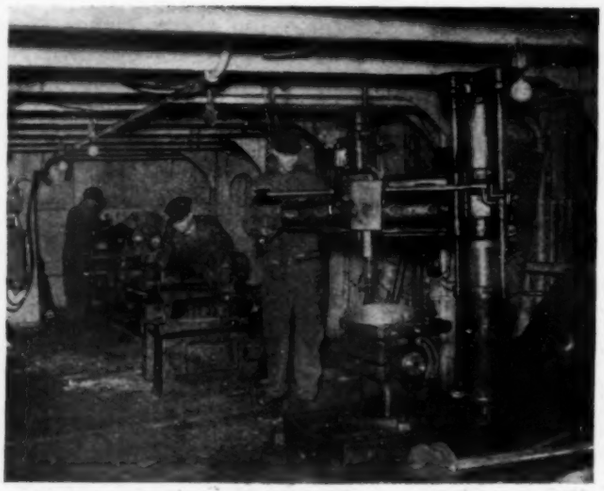
The views shown herewith are from the Port repair shop of the S. S. Leviathan.

The equipment comprises the following machine tools:

Le Blond 33-in. x 14-ft. heavy-duty lathe. Racine power hack-saw. Lodge & Shipley 18-in. x 8-ft. geared-head lathe. 26-in. Stock bridge shaper. Morris radial drilling machine with 3-ft. arm. Le-Blond 18-in. x 10-ft. lathe. No. 35 Ranscombe grinding stand. All the machines but one are direct motor driven.

The Starboard machine shop is equipped with practically obsolete German machines which have not been replaced by ones of American manufacture.





It Pays to Replace—

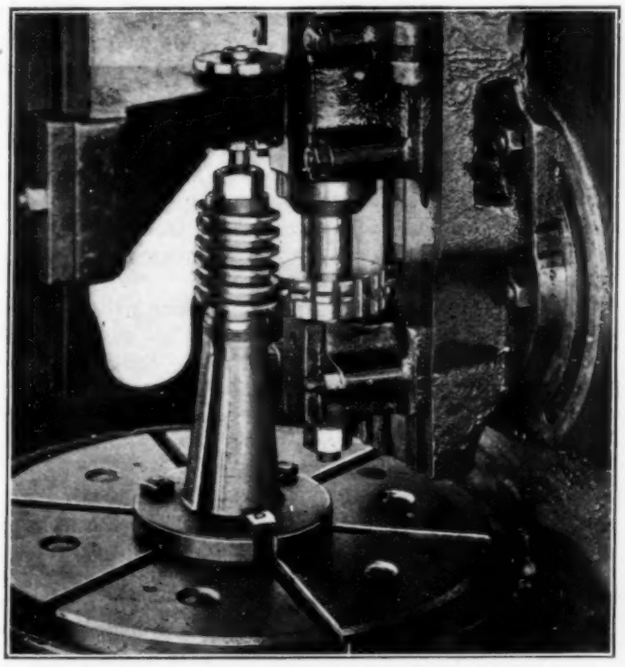
How a Shop Saved by Replacing Old Shop Equipment with New Equipment

These articles won honorable mention

By Thomas E. Warburton
General Foreman, Fitzgibbon & Crisp, Trenton, N. J.

ONE of our main products is a transmission mechanism for a rotary dump. In this transmission mechanism we were using a bronze worm, which was found not serviceable for the work it had to do, so it was decided to use a worm made of chrome-nickel steel. One worm was required for each dump and the approximate number used in a week's production was twenty-five.

Our usual method was to thread the bronze worms in an engine lathe which was a quick and cheap method. When we started to thread the chrome-nickel worms in the lathe, our troubles commenced. The material would drag and tear, and the length of time taken to finish the threading made the cost excessive. We could not



GEAR HOBBING MACHINE ARRANGED FOR HOBBING WORMS

think of a thread milling machine, as the only use we would have for a machine of that kind would be threading these worms. We had three Gould & Eberhardt gear hobbing machines, and seeing an article in the *American Machinist* describing a system Gould & Eberhardt had developed for hobbing worms on gear hobbing machines, we investigated the subject and decided to have one of our machines changed, so we could hob our worms.

We got everything ready for the trial, but were skeptical as to the promises of the builders of this improved hobbing system as to production. But after a few days the operator got used to the method of loading and unloading and he was producing, when necessary, three worms per hour, just as the builders of the machine guaranteed.

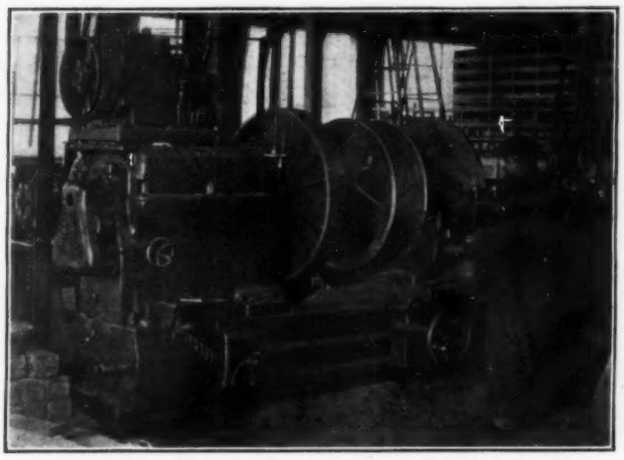
Today we can produce all the worms we require for our week's production in nine hours. The hobbing makes a good job, and we are well pleased with the change we made. The cost for making the change was approximately $340. If we had continued the old system of threading in the lathe, we would have had to purchase another lathe, but our shop being a small one we did not like the idea of expending, say, $1,800 when we could get the results required at considerably less cost.

The operator attends to three hobbing machines when he is hobbing worms, but when we cut the worms in the lathe, it required a skilled lathe hand to give his attention to one machine.

The moral of the story is this, it pays to investigate. Herewith is a photograph of the set up, ready for cutting the worms.

By Edwin C. Rosenberg
Factory Supt., F. Rosenberg Elevator Co., Milwaukee, Wis.

IN ORDER to increase production on a specially built "Advance" lathe having a cone-pulley drive, we decided to equip it with some type of variable speed direct-drive unit. Owing to the fact that we were unable to get direct current, we eliminated the direct motor drive, and a multi-speed a.c. motor would not give us the range in speeds that we required.



OILGEAR AND MOTOR MOUNTED ON LATHE

In going through the advertising section of the *American Machinist*, which we do with every issue, we came upon the advertisement of the Oilgear drive. We investigated this equipment at once and found it to be the ideal variable speed drive for our purpose. We placed the order within a week's time for one, type-M Oilgear transmission. We mounted this unit on a bonnet over the headstock, as shown in the illustration, and connected the transmission to the lathe spindle with a Morse silent chain.

The Oilgear transmission was driven with a 7½-hp. 1,800 r.p.m. squirrel-cage motor made by the Northwestern Mfg. Co. The motor runs continuously and the control for the transmission consists of the small wheel back of the face plate. Due to the fact that only short jobs are handled on this lathe, the control is within easy reach of the operator.

Ordinarily this size of lathe would require a 15-hp. motor for direct drive, but with the Oilgear equipment we are able to cut the production time 50 per cent, due to the great range of speeds, positive drive and instant control. Shutdowns have been eliminated, for, after more than a year's severe service no trouble has been reported.

By Thomas E. Warburton
General Foreman, Fitzgibbons & Crisp, Trenton, N. J.

AMONG other things, we make transmissions for power dumps in which there are four holes tapped ½ in. U.S.S., and four holes tapped 1¼ in. 20 threads. The holes were tapped by hand and, in addition, studs were inserted in the ½ holes, all the work being done by the piece. Many of the holes were not tapped straight and the studs would stand at an angle, requiring them to be straightened before the parts could be assembled. As the studs were heat treated and pretty hard, many of them were broken in straightening, causing trouble and expense in getting the broken ends out of the holes.

To get out of this trouble, we bought a Jarvis tapping and stud setting machine, equipped for drilling and tapping the holes and setting the studs in one setting of the work. This machine enabled us to cut the piece work price 25 per cent and, what is of greater importance, the holes are tapped straight, so that the studs stand at a right angle to the face of the work.

We have had this machine in use for nine months and we have not broken a tap in that time. Its use has saved us money, worry and uncertainty.

By Harry R. Carr
Inspector, Ward Motor Vehicle Co., Mt. Vernon, N. Y.

THE value of using the latest labor- and time-saving equipment was demonstrated at the plant of International Motor Co., Plainfield, N. J., where the writer was formerly employed as a block tester.

Wristpins were formerly ground on a standard type of cylindrical grinding machine, which necessitated their being put on an arbor and placed between the centers of the machine. All this took time and as the limits were very close +0.0001, —0.0002—the net production was about ten pins per day per machine.

As business grew it was realized that this method was entirely too slow and costly, so two Sanford centerless grinders were ordered. When put into service, these machines increased the production about 400 per cent and replaced five of the standard type of machines.

Another machine to be replaced at the same plant, was an old radial drilling machine which had been used for drilling and tapping crankcases. It was replaced by a new Cincinnati radial drilling machine of improved design and the production was boosted about fifteen per cent.

If new equipment would not save money, concerns like the International Motor Co. would not spend thousands of dollars to replace machines still capable of producing acceptable work.

Over-head Oxyacetylene Welding

By C. J. Nyquist

Over-head welding on steel or welding on the under side of steel plate or other articles of steel requires thorough knowledge of proper heat distribution and the homegenous spread of the welding material. Practice may enable the welder to make the material stick in place, more or less loosely adhering to the base metal, but sound over-head welding simply cannot be done unless the heat of the flame and every particle of the added metal are distributed in just the right way. The injurious so-called pool welding of steel is of course impossible in over-head welding on account of the position of the work. Utmost care must be used in handling the welding rod.

A discussion with steel welders who have practiced over-head welding is quite illuminating. Some declare that a very stiff flame facilitates welding over-head while other welders make special claims for certain choice welding rods, and some others rely on a more or less fancy manipulation of the torch. Good welding material is certainly always desirable, but high gas pressure is neither necessary nor conducive to good results. The idea that the molten material must be blown on or driven on to the base metal by force is quite erroneous, in fact, much better welding on steel, overhead or otherwise, is done with what is generally termed a soft welding flame.

A drop of hot steel will retain its round shape when deposited on a cold steel plate but when the plate is heated to the same or very nearly the same temperature as that of the deposited metal the spread is readily accomplished. In other words, when the base metal is heated sufficiently the added material will spread without difficulty.

Experienced welders know that by increasing the heat in any direction the molten metal from the welding rod may be made to follow the flame. They also know, or should know, that so-called chasing or pushing the weld metal or the attempt to force the molten or nearly molten weld metal forward results in overlapping and consequently in poor welds. While it is self-evident that the metal cannot for obvious reasons be heated to a liquid state when welding over-head, it is equally true that overheating of the weld metal (the added material) in all steel welding is responsible for many failures.

Successful over-head welding most certainly demands considerable practice, steady hands and the will to overcome difficulties but even more important than these is the proper application of the first principles of oxyacetylene welding—simultaneous and uniform fusion of the base metal and the weld metal.

From the *Journal of the American Welding Society.*

Casting Crown Brasses and Hub Plates in Place

By FRED H. COLVIN
Editor, *American Machinist*

A method which saves much machining and is giving good results on heavy locomotives—The molds and how they are handled—Casting the oil grooves

AMONG THE advanced practices at the Scranton shops of the Delaware, Lackawanna & Western Railroad is their method of casting the crown brasses in driving boxes and also the hub plates for taking the wear due to the side thrust of the driving wheels. This method saves a tremendous amount of fitting and is producing excellent results, even on the heaviest locomotives. It saves the machining of the driving box to receive the crown brass, and also the machining of the outside of the crown brass itself, as well as the pressing it into the driving box, and the application of a hub plate.

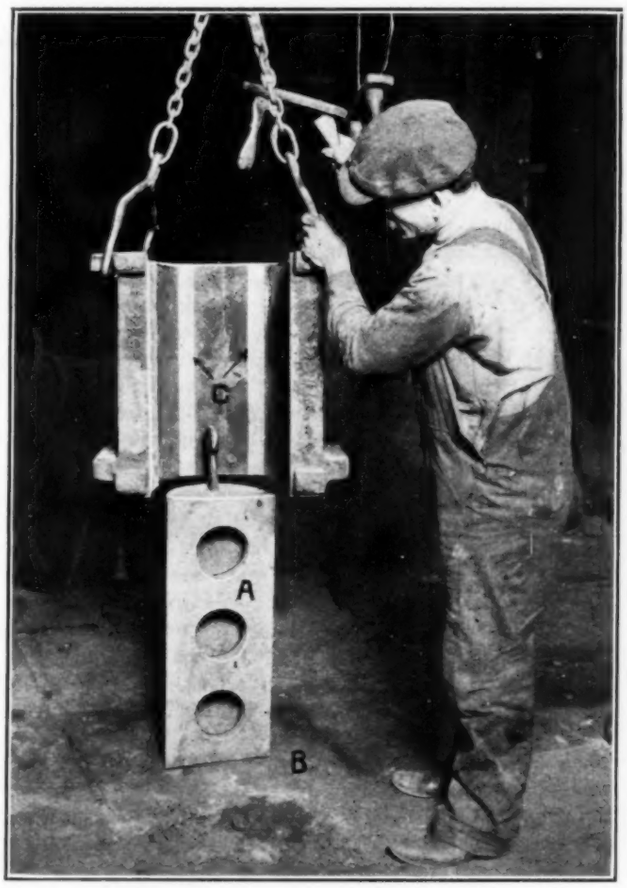


FIG. 1—LOWERING BOX OVER CORE.

By the method shown, both the crown brass and the end or hub plates are cast at the same time. The core or cast iron chill *A* is placed on the metal plate *B*, Fig. 1, the other side of the core or chill being plainly shown in Fig. 4. The driving box has two dovetailed strips planed in the top, as shown at *C*, and the end is also undercut to help hold the wearing plate on the end.

The box is then lowered over the core by a suitable hoist, as in Fig. 2. Side plates are put in the grooves shown in the core at *A* and *B*, and form the lower edge of the crown brass, preventing the metal from flowing in this direction. Then the retaining ring *C* is placed in the upper part of the turned portion on the end of the box, forming the mold for the wearing plate or hub plate on the end.

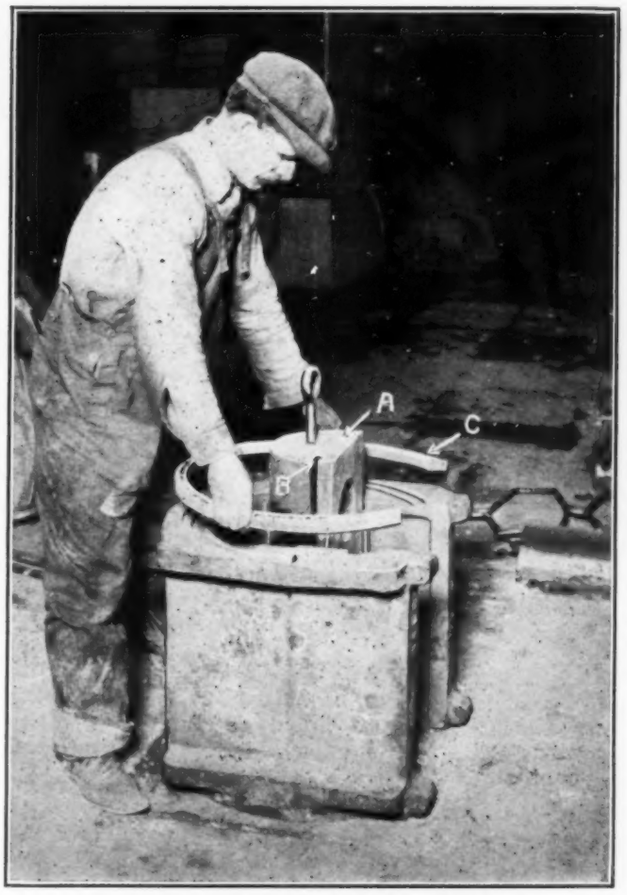


FIG. 2—SETTING UP PLATE RIMS.

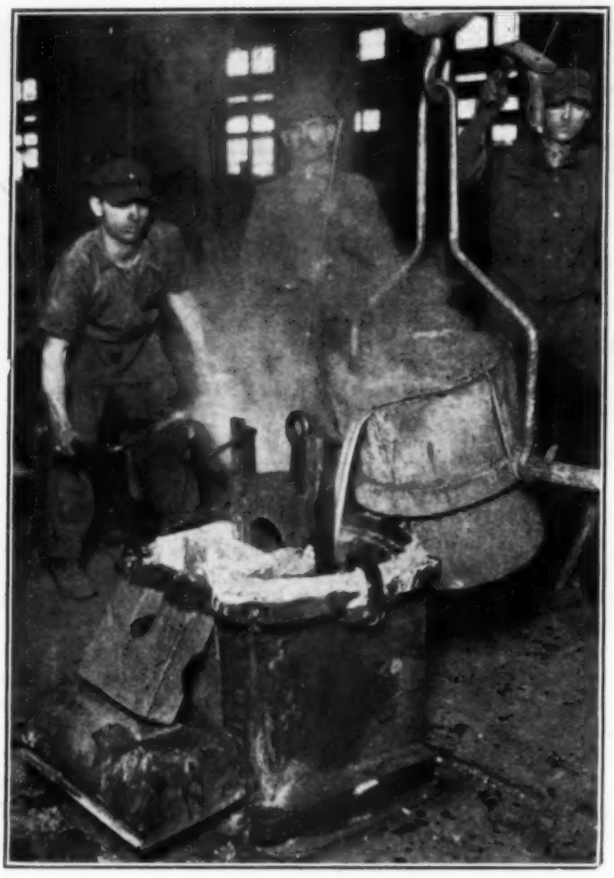


FIG. 3—POURING THE BEARING

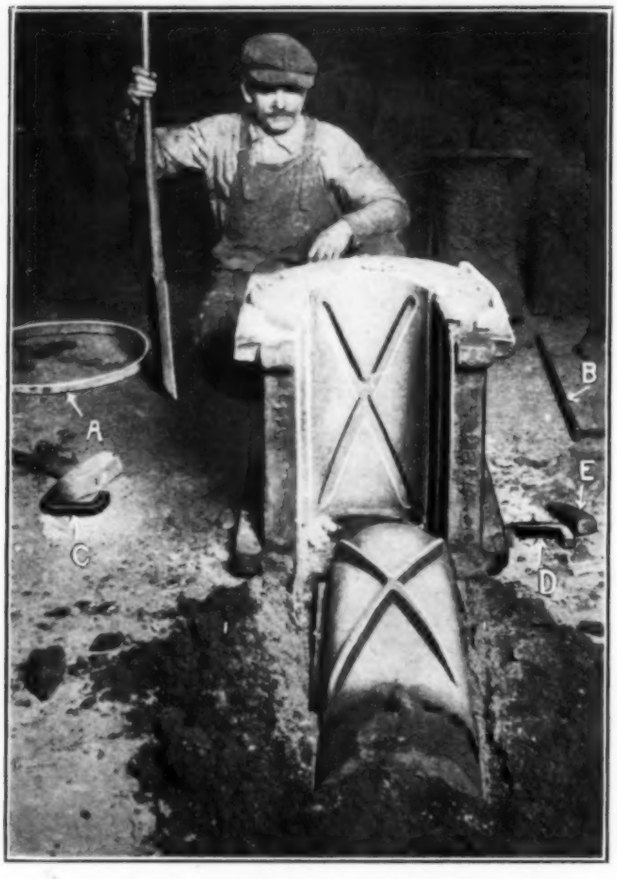


FIG. 4—CORE REMOVED FROM COMPLETED BEARING.

Other pieces are placed between the end of the ring *C* and the core itself and all thoroughly luted with fireclay, after the ring has been clamped in position, as shown in Fig. 3. This illustration shows the complete mold, and it will be noted that another core has been placed against the lower side of the driving box in order to steady it against movement should it be accidentally touched by the ladle. In Fig. 3 is shown the pouring operation and also the two side strips in position, these being held by keys or wedges at the upper end.

In Fig. 4, the ring has been removed, the keys and side pieces withdrawn and the core itself pulled forward out of the mold, so as to show the complete bearing in the driving box. This illustration also shows how the oil grooves are cast in place by ribs on the core. The ring may be seen at *A*, one of the wedges at *B*, and the two clamps at *C* and *D*, together with one of the small wedges *E* by which the clamps are held in position.

This method of casting crown brasses and hub plates at the same time has effected a considerable saving and is a marked advance in driving box work. The driving box shown is 12 in. in diameter by 20 in. long.

The core or cast-iron chill is first heated and coated with tar, and after each pouring operation it must be again coated with tar while still hot. After the mold is completed and ready to pour, crude oil is applied with a swab to prevent formation of gas holes.

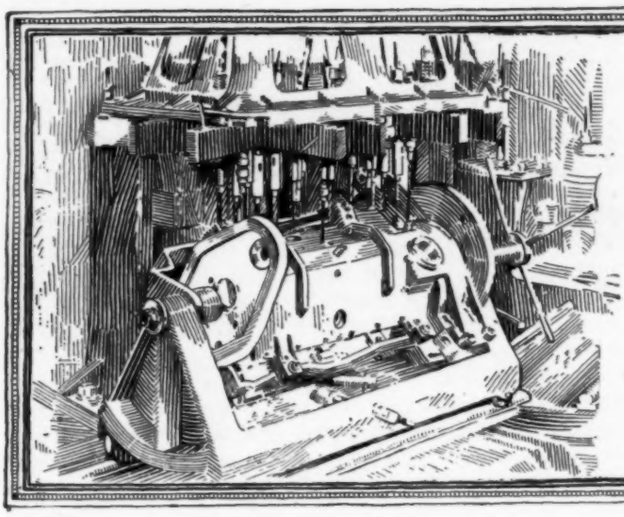
The Automotive Industry in Australia

The annual sales of motor cars in Australia now amounts to about 16,000 according to an average of the estimates and there is every reason to believe that the demand will continue to grow, especially when it is realized that the buying capacity of nearly every Australian is probably slightly higher than that of the average American says a report to the Department of Commerce from Consul H. H. Balch, Adelaide. Cars in Australia are used essentially for business purposes. Because of the great area of the country the farmers and pastoralists have found them indispensable.

In both the motor car and the motor truck trade, as well as in motorcycles, American makes predominate. American motor car dealers estimate that practically 75 or 80 per cent of the motor cars sold in Australia, are manufactured in the United States or in American factories established in Canada.

Motor car body-building and tire manufacturing under the stimulus of high tariff duties have grown to be very important industries in Australia. At present Adelaide is the seat of the motor body industry. One Adelaide plant alone employs over 800 men and now turns out approximately 10,000 motor bodies a year, valued at about 830,000 pounds sterling, which is about 60 per cent of all the motor bodies manufactured in the country.

Unlike the motor vehicle trade which, with the exception of motor bodies, must depend almost wholly upon foreign manufacturers, tire rubber manufacturing has become an important arm of Australian industry and about 50 per cent of all the tires and tubes sold in the country are the output of her own factories. The remaining 50 per cent are imported from the United States, France, Canada, England, and Italy. About half of the imported tires, or 25 per cent of all tires sold in the country come from the United States.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Indicating inspection gages for gears—Fixtures for determining accuracy of pitch circle—Determining smoothness of running—Inspecting gears by projection

IN ADDITION to the gear testing devices already considered, another fixture which is designed for testing the accuracy of the pitch line is shown in Fig. 561. In this example the base of the fixture *A* is of cast iron, and on it is mounted in a fixed position a stud *B* on which a master gear *C* is free to revolve. The other gear *D* which is to be tested is placed upon the stud *E*, which is mounted on a movable slide *F*. This slide can be moved backward or forward by means of the handwheel *G*, which operates the screw *H*. The coil spring *K* is placed between the boss *L* and the lug *M* in order to keep the gears in contact.

The slide *F* carries on one side a bracket *N*, on which is mounted a dial indicator *O*. The push rod of this indicator comes in contact with the end of the lever *P*, which is pivoted on a pin *Q* at its lower end. Adjustment for different sizes of gears can be readily obtained by a movement of the screw *R*, which can be adjusted by means of the knurled handle *S* and can be locked by the check nut *T*. When adjusting for various sizes of gears a master gear must be used to obtain the correct setting.

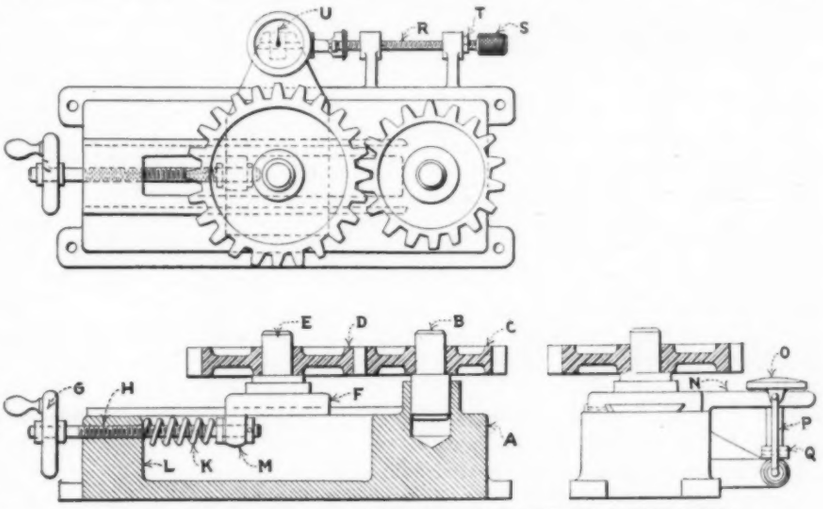


FIG. 561—FIXTURE FOR TESTING ACCURACY OF PITCH LINE

When the operator uses the fixture he places the gear in position as shown at *D*, and then moves the screw *H* forward until the spring *K* forces the gear into position. By revolving the gears in mesh the indicator pointer *U* will fluctuate both sides of the zero mark and thus show inequalities in the cutting.

This fixture is not a particularly expensive one and its adjustable features make it possible to adapt it to several sizes of gears. It is advisable to give a word of caution here in regard to the use of master gears. It is never advisable to attempt to determine the accuracy of the pitch circles of two gears at the same time. One of the gears should always be a master gear which has previously been tested and found to be correct. Otherwise the test will simply show inaccuracies in pitch lines, but will not tell which gear is incorrect.

Another method which can be used for determining errors in the accuracy of the pitch line and for imperfect teeth is shown in Fig. 562. This fixture is designed for testing a single gear, but the same principle can be applied to an adjustable fixture which can be so arranged that several sizes can be tested by making simple adjustments. The designer should remember that whenever it is desirable to test the rolling action of two gears, the errors which appear should be multiplied in order to make them more apparent. Unless a fixture can be so made that it will be sensitive and at the same time multiply inaccuracies, it is very little better than a hand test. It is easy to understand that the sense of touch is of little value in testing gears when running them together, because the "high spot" on a tooth can scarcely be detected by the operator. On the other hand, if the gears are so arranged that the high spot causes an appreciable fluctuation of a needle over a graduated scale, the error can be quickly detected.

Gears for certain kinds of work are often made in pairs, so that they must always be kept together and

For the author's forthcoming book. All rights reserved.

assembled so as to mesh in a certain way in the finished machine. The pinion and ring gear of an automobile are often made in this way, and it is usually advisable to purchase them in pairs in the event of breakage. Spur gears, however, are not usually paired, and if they are tested with master gears as suggested, there is usually little trouble in obtaining quiet gears.

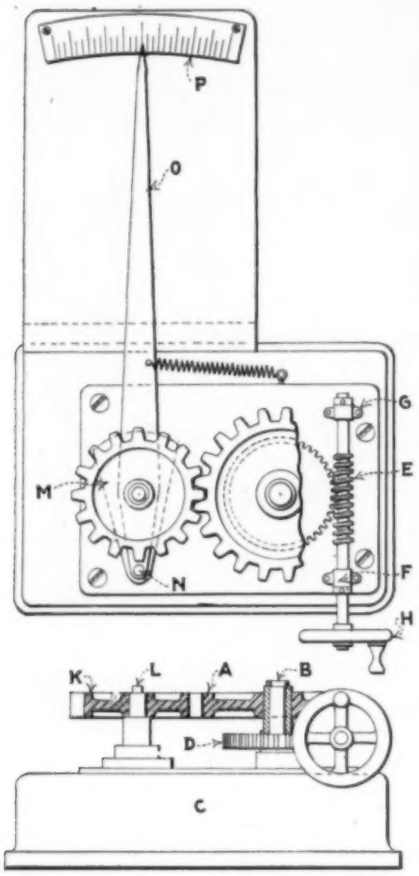


FIG. 562—TESTING FIXTURE FOR SPUR GEARS

Referring to the illustration, the master gear *A* is mounted on a stud *B* set in the base *C*. To this stud is keyed a gear *D*, which meshes with a rapid - action worm *E*. The worm shaft has bearings at *F* and *G*, and the handwheel *H* provides a means of propulsion. It will be noted that the worm has a steep pitch in order to produce a fairly rapid movement. The master gear *A* remains in position at all times while a certain set of gears is being tested. The other gear *K* which is to be examined for accuracy is placed on the stud *L*, which is mounted on a sector *M* pivoted at *N*. A long indicating pointer *O* extends to the graduated scale *P*.

It is apparent that when the handwheel *H* is turned the gear *A* will mesh with gear *K*, which will revolve on the stud *L*. As it revolves any high spots on the teeth will cause it to creep away from the master gear, and the amount of the fluctuation will be indicated on the scale *P*. The designer can adapt this principle to other varieties of gears, and can even make the fixture adjustable so that several sizes can be taken care of in the same fixture. Probably the easiest way to make the fixture adjustable would be to mount the worm and master gear on a slide so arranged that the center distance can be changed at will within certain limits.

We have previously shown several testing fixtures for determining the accuracy of the cutting of spur gears, and in order to amplify the subject and to show how other principles can be applied, we illustrate in Fig. 563 another type of testing fixture for a similar purpose. In this example the base *A* is of cast iron, and on it is mounted a stud *B* on which the master gear *C* is placed. The lower part of this stud carries a worm gear *D*, which meshes with a rapid-pitch worm *E*. One end of the shaft on which this worm is cut, carries a handwheel *F* by means of which the gear can be easily revolved.

The stud shown at *G* carries the gear *H* which is to be tested. After this gear has been slipped on the stud, a gear *K* of fine pitch is placed above it and the nut *L* tightened. A bracket *M* is arranged so that it will slide in the guides *N*, and its permanent location is controlled by means of a pin *O*, which enters the bushing in the base of the fixture. This construction is not shown in the illustration. On the bracket *M* the pinion *P* is mounted in such a way that it will mesh with the large gear *K*.

A steel disk *Q* is graduated into a number of equal divisions, as shown in the plan view. The pointer *R* travels around this graduated disk when the handwheel *F* is operated. The ratio between the gear *K* and pinion *P* should be made as great as possible and a ratio of 10 to 1 will produce good results. When the handwheel *F* is turned rather rapidly and uniformly, the pointer *R* travels around the disk quite rapidly; and due to the multiplication between the gear *K* and pinion *P*, any inequalities in the cutting of the gears are clearly shown by an irregular movement of the pointer. If gears are cut very accurately the movement of pointer *R* will be smooth and uniform, while if the gears are poorly cut the action will be quite irregular.

We have previously taken up the matter of inspection of thickness of tooth at the pitch line, depth of tooth and shape. These are all matters which are usually taken care of while the gears are in production. Unless trouble is found, they are frequently not tested at the final inspection. The procedure varies with different manufacturers, and each maker must be a law unto himself, according to the difficulties which he has encountered in manufacture.

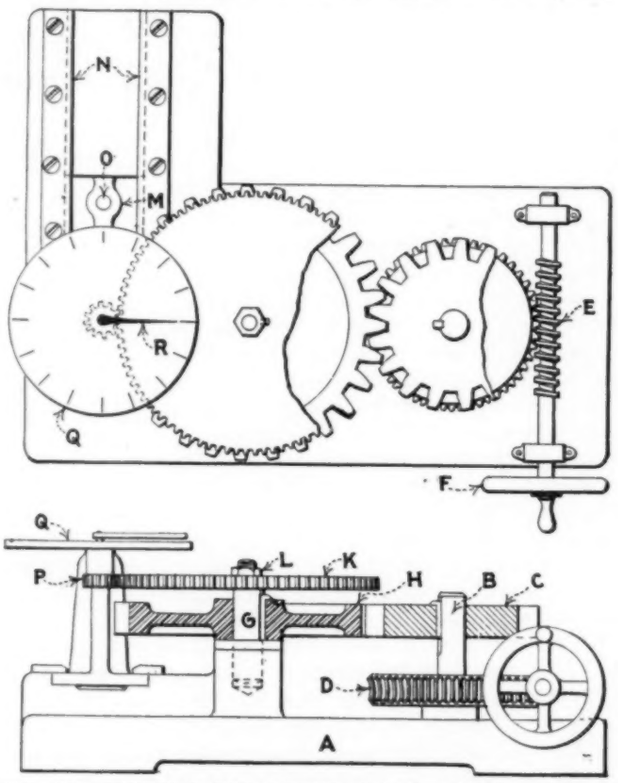


FIG. 563—FIXTURE FOR DETERMINING SMOOTHNESS OF RUNNING ACTION OF SPUR GEARS

No article on gaging would be complete without mention being made of a process quite commonly employed for comparing the shapes of gear teeth with a master tooth of accurate form and size. The use of instruments of this kind does not strictly come under the head of tool designing, and we shall make but brief mention of the matter, in order to give the designer an idea of the process. Briefly, the gear which is to be tested is set up in such a position that a beam of light will cause it to throw a shadow very greatly magnified, upon a screen suitably placed. On this screen can be placed an outline of the gear tooth as it should be if correctly cut; and by projecting the shadow upon it, irregularities can be easily determined and the cutting of the teeth perfected until the tooth approaches as nearly as possible to the ideal form.

The instruments used for the purpose of projecting the shadows are comparatively simple in their form, and we do not consider it necessary to illustrate them in this article. To those who are particularly interested we suggest that mechanical trade journals contain considerable information on the subject, and that particulars can be obtained directly from the manufacturers of the instruments.

Budgeting for Business Control

IN the past two years interest has been shown by business men and business organizations in applying budgeting principles for purposes of business control. The Chamber of Commerce of the United States has issued a pamphlet on the subject called "Budgeting for Business Control." The Boston Chamber of Commerce has published a study of business budget practice called "Budgetary Control for Business." There are budget committees of the National Dry Goods Association and of the National Electric Light Association developing budget systems for department stores and public utilities, respectively.

It appears that the budget idea may be applied to a great variety of businesses, and to almost every department of a particular enterprise. Complete budget systems are in successful operation in ice cream plants, hotels, magazine publishing plants, zinc mines, garment factories, banks, and agricultural implement, optical specialty, and metal product factories. Sales, purchasing, financial, production, and advertising departments are operated on a budget basis in a great number of establishments.

Objects of Budgeting

These objects are generally stated as the aims of budgeting:

1. To provide for the harmonious working of the various departments and activities of a business. Thus, for example, the sales program is adjusted to financial resources and manufacturing facilities.

2. To provide in advance for all foreseeable contingencies—that is, to ensure considered planning before doing. Sales programs may require new construction; new construction may demand additional financing; all of which will be taken care of, or, if necessary, such programs modified, in a properly devised budget system.

3. To provide a measuring rod with which to check results against expectations and estimates. The sales quota of the general sales manager becomes a promise to the company that certain volume of sales will be obtained during a given period. If such volume is not so obtained, the sales manager is called upon to justify this failure. What is true of the sales manager applies to each of his branch managers, to each individual workman. In other words, the budget supplies the basis for enforcing accountability.

It is in this connection perhaps that the budget works most directly for efficiency, since the aim of everyone in that organization where a budget plan is in force is not only to equal but to exceed the budget or estimate. The stakes of one month, season or year, when steadily maintained, are reset to some new and more difficult goal. A good executive, as well as an efficient employee, always "plays the game" to better his budget promise of performance.

Accurate forecasting, while valuable, is by no means the only justification for budgeting, for results under budgeting operation may be quite as helpful should performances vary widely from estimates. Thus, the actual selling expenses of a manufacturing concern were 11 per cent higher than the estimated selling expenses, immediately showing the executives of the company where there was a possible opportunity for economy.

Establishing a Budget System

Manufacturers who employ the budget method report that there is nothing rigid or inflexible about budgetry control, but that estimates are revised as business conditions warrant.

It is stated over and over again by those with experience that a budget system cannot be introduced overnight, but that it has to be a matter of growth and evolution, and that it is essential that the budget idea be "sold" to the entire organization.

All companies, we venture to say, do some budgeting, although the term "budgeting" may not be in use by them. "Budget systems," says Prof. D. E. Burchell of Harvard University, "are as old as business and probably older." A manufacturer expresses the same thought in a slightly different manner. "I am really surprised," he said, "by the amount of budgeting I have been doing all my life, though I never knew it."

Budgeting Not a New Scheme

A few common examples of budgeting will readily suggest themselves. The allowance for depreciation is in the nature of budgeting, for its purpose is to provide ratably in advance for the eventual loss in usefulness of equipment and buildings. Similarly, reserves for bad debts are a species of budgeting, for their object is to anticipate the loss likely to arise from uncollectible accounts. In both cases past experience is used as a guide to take care in advance of circumstances almost certain to arise—which, by the way, is a good description of the procedure called budgeting.

What, however, is new and significant about present day methods of budgeting is that business men have found it of great advantage to combine in a single, co-ordinated system all the odds and ends of adjustments they have been accustomed to make. By so doing, it is easier to place responsibility for results and to harmonize programs of numerous departments of a business.

From "Business Leaflets" published by the Metropolitan Life Insurance Co., New York City.

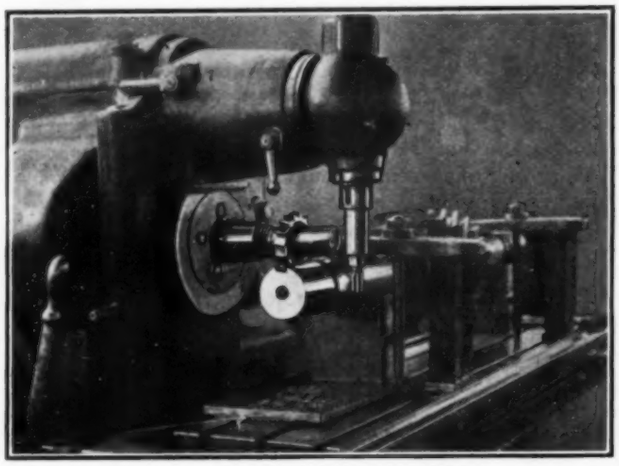
Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

An Unusual Milling Set-Up

BY TOM J. O'REILLY

The illustration herewith shows a keyway milling operation in process in the plant of the Falk Corporation, Milwaukee, Wis. The machine is a Milwaukee No. 3-B horizontal milling machine with a vertical milling attachment. A plain milling cutter on a stub arbor



AN UNUSUAL MILLING SET-UP

is used for cutting the keyway to the required length, which is four in., then the table is lowered and adjusted to the ¾-in. end milling cutter. The end mill is used at the inner end of the keyway and cuts a square corner in the bottom of the keyway and forms a radius in the end. The plain milling cutter runs at a speed of 40 r.p.m., while that of the end mill is 120 revolutions per minute.

Interlocking Device for a Horn Press

BY JOHN WILLIAMS

The tapered cups shown in the accompanying cut are made by rolling them up from black sheet and lock-seaming the edges. Closing the seam is done in a horn press with the tools here illustrated.

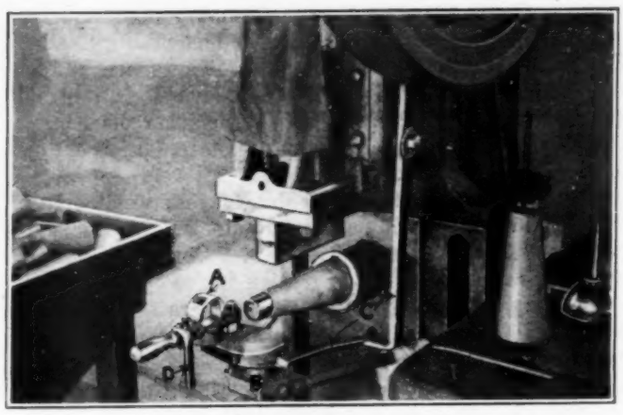
Because of slight variations in temper of the metal it is impossible to have the edges match exactly at top and bottom of the cup as they come from the rolls, and it is necessary to put the work under pressure endwise before finally closing the seam.

The arbor, or horn, is ground to a tight fit for the interior of the cups and when one of the latter is placed over it, it requires a considerable effort to force it back against the shoulder, straighten up the edges and draw the longitudinal seam firmly together. This effort is applied by the operator by means of the ring *A*, which swivels upon the supporting bracket *B* and is provided with a convenient lever handle.

The unusual feature of the tools is the method adopted to make sure that the press may not be tripped until the work is pushed back against the shoulder and the edges thereby straightened up. The lever *C* operates a latch in the tripping mechanism and is in turn operated by the projection *D* on the swivelling handle.

With a cup in place, the operator swings the handle until the ring contacts with the cup and forces it into its final place, at which time the handle has assumed a position at right angle to that shown in the picture. Besides pushing the cup to place against the shoulder, the ring also provides an outer support for the arbor.

When the handle has been turned as far as it will



TOOLS FOR CLOSING A SEAM

go, the edges of the cup have been straightened up and the projection *D*, bearing against the end of lever *C*, has withdrawn the latch in the tripping mechanism and the operator may trip the clutch by depressing the treadle of the press in the usual way. No amount of movement of the treadle will, however, accomplish this result unless the ring *A* is in its proper place.

Soldering Cast Iron

BY C. F. BARTON

Cast iron can be successfully soldered if care is taken in cleaning the work and the right acid and solder used. The cast iron must be thoroughly clean. The scale must be ground or chipped off and the surfaces thoroughly tinned.

The surfaces should be swabbed with muriatic acid in which zinc scrap has been cut, as is commonly used. Heat the soldering iron very hot, almost to a red. It is hard to get it too hot for this work.

Use a solder made up of 2 parts tin, 2 parts lead and 1 part zinc, both for tinning and for soldering the work.

For a harder solder to be used when the work is subjected to considerable heat, use 50 per cent more zinc. In other words, for the hard solder use 2 lb. of tin, 2 lb. of lead and 1½ lb. of zinc.

Soldering with the Electric Arc

By Milton Wright

In a shop manufacturing an electric specialty for which the demand was running to quantities that made intensive methods of production necessary, the job of soldering three electrical connections in each device was proving to be a stumbling block in an otherwise

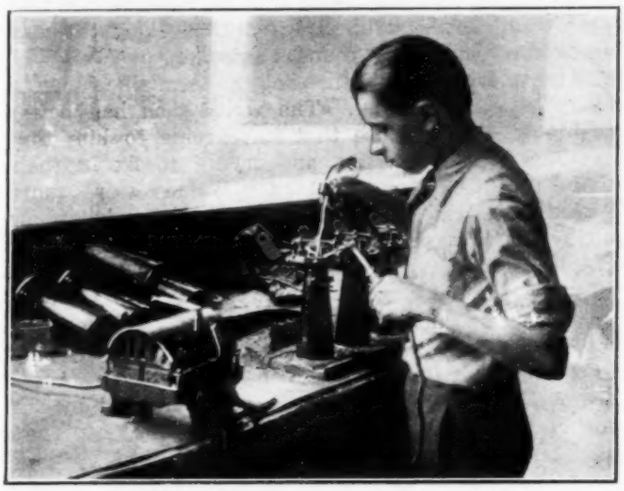


FIG. 1—SOLDERING WITH THE ELECTRIC ARC

smooth and orderly progression of operations. Where other operations were so timed and calculated that each operative could give his or her entire attention to the doing of one thing, this one required the services of several boys and girls, with no assurance that the steady forward flow of work would not be interrupted without notice because of the failure to deliver the soldered parts to succeeding operations.

The first method made use of gas-heated soldering coppers, but the work was slow and the results more or less uncertain. Electrically heated coppers were substituted, with little improvement. Metal bench plates

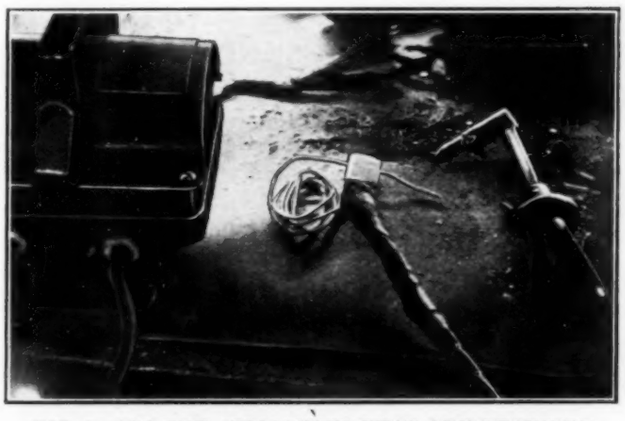


FIG. 2—ALL THE APPLIANCES THAT ARE REQUIRED

were installed before each operative, connected to one of the secondary leads of a small transformer and the soldering copper connected to the other so that the device to be soldered (which is entirely of metal) became a part of the electric circuit; but the results still left much to be desired.

On his way to the shop one morning, the superintendent in charge spied beside the roadway a stub of ordinary electric arc light carbon that had been discarded by some careless lamp trimmer. He had probably seen thousands of them before under similar circumstances, but this one contained the germ of an idea.

Arriving at the shop the superintendent rolled up his sleeves, connected the piece of carbon to one lead of the transformer and a piece of solder wire to the other, placed one of the devices to be soldered on a wooden block and touched the tips of his improvised electrodes together at the desired spot. There was a flash, a sizzle, a little curl of smoke as the arc formed and broke, and the job was done.

Bronze holders with wooden handles were made to take the carbons, spring clamps, also of bronze, into which a coil of solder wire could be set without delay were provided, and both were connected to the transformer. The operative places the point of carbon in contact with the spot to be soldered and touches the end of it with the solder. The flow of current instantly heats the solder nearly to the melting point so that when it is drawn slightly away from the work to form the arc it fuses with almost explosive quickness.

One boy and one girl now handle the work, and are not rushed. There is no waiting for coppers to heat and no imperfect joints due to insufficient heat. A row of the devices to be soldered is set up on the bench, flux applied with a small brush, and the joints gone over with the electrodes. It takes longer to apply the flux than to do the soldering.

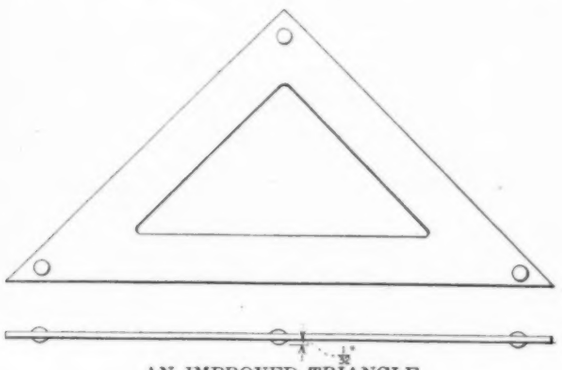
The operation is shown in Fig. 1, and Fig. 2 shows the tools; including the transformer. This latter is wound to deliver 6 volts with 110 volts on the primary terminals. Though small, it is big enough to supply current to a dozen workers if necessary, for not all of them would be drawing current at the same instant.

Improved Drafting Triangle

By E. J. Hanson

I have used the triangle shown in the accompanying sketch to advantage and pass the idea on to others who may be interested.

Holes are drilled in the corners of the triangle and steel balls are pressed into the holes. The triangle then



AN IMPROVED TRIANGLE

rests on the balls and its surface does not touch the drawing or tracing.

When making paper drawings the use of this triangle insures a cleaner drawing. There is less chance of blotting lines when tracing, and since the triangle can be used over wet lines, the time that is often wasted in waiting for ink to dry is saved.

Formula for Finding Root Width of Splineways—Discussion

BY GEORGE E. HODGES

On page 775, Vol 58 of the *American Machinist*, Clarence D. Scrom gives his formulas for determining the root width of splineways. His methods are all right for the man with a table of trigonometric functions, a knowledge of "trig," and the time. There are cases where the shopman lacks these essentials, and in those cases the following method and formula used by the writer may be helpful.

$$W = 2C\left(R - \frac{T}{2}\right)$$

In this formula W is the required dimension, R is one-half the root diameter of the shaft, T is the thickness of the spline and C is a constant for shafts having a similiar number of splines. A table of these constants

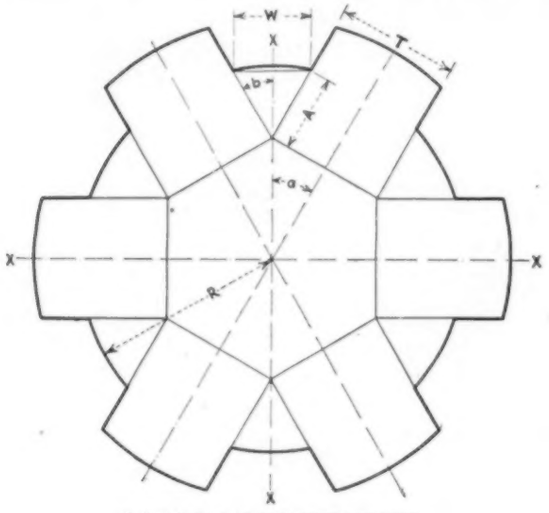
TABLE OF CONSTANTS FOR DETERMINING WIDTH OF SPLINEWAYS OF COMMONLY USED SPLINE SHAFTS

No. of Splines	Angle	C
4	45°	0.70711
6	30°	0.50000
8	22° 30′	0.38268
10	18°	0.30902
12	15°	0.25882
16	11° 15′	0.19509
20	9°	0.15643
24	7° 30′	0.13053

Use no more significant figures in C than necessary for the accuracy of the result desired.

is here given for commonly used shafts. The authority for the constants is the table of functions found in the "American Machinist Handbook."

The sketch herewith shows how the formula is arrived at. After locating the center of the figure by drawing the center lines X—X, a circle is drawn to represent the root circumference of the shaft. From



LAYOUT OF SPLINE SHAFT

the center of the circle, equally spaced radial lines are drawn to represent the center lines of the splines. Parallel to these center lines, lines are drawn representing the sides of the splines. If these latter lines are extended to meet, by joining the points a geometrical figure with equal sides may be drawn.

We now have a plane figure with equal known sides, and we seek the long diagonal. This value is then divided by 2 and the quotient subtracted from the radius of the root circle, the difference being the dimension A in the figure. It is also the hypotenuse of a right-angle triangle of known angles and one known side. By the geometry of the figure the angles a and b are similiar, and are directly related to the number of splines in the section. From this fact, we deduce that a table can be constructed which will show the sine function of commonly found angles.

To the average man in the shop the term sine function means little or nothing. The writer has had better results by telling those that have come to him that functions were constants, and trying to fix in their minds that being constants the values were more convenient to remember and apply. It is surprising how quickly the average man will pick up a commonly used constant and fix it in his mind.

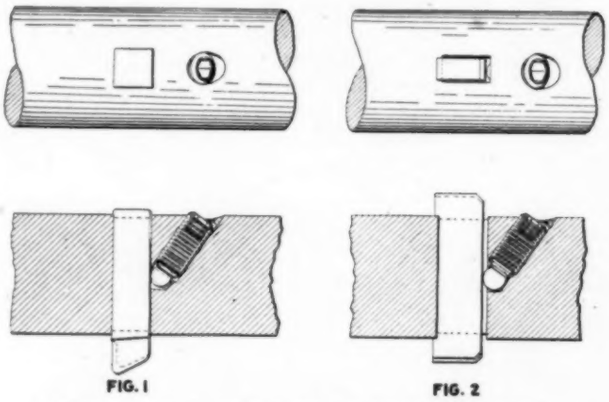
To use the table and formula given here requires but elementary knowledge of arithmetic. The formula requires a knowledge of geometry and trigonometry only for the proof of its theory. In a great many instances only one or two constants need be memorized by the user of the formula.

Holding Tools in Boring Bars

BY F. HERSTEIN

After considerable trouble with methods of holding tools in boring bars, the one shown in the sketch herewith was evolved.

The tool slot in the bar is made large enough to



FIGS. 1 AND 2—METHODS OF HOLDING TOOLS IN BORING BARS

receive the tool freely, and a hole is drilled at an angle greater than 45 deg. from the axis of the bar, so that the point of the drill just breaks through one side of the slot. The hole is then tapped and a steel ball inserted and backed by a safety setscrew having a cup point. Tightening the screw forces the ball against the tool and holds it firmly in place.

One of the advantages of this arrangement is that neither the ball nor the setscrew need be removed from the bar to change or adjust the tool, so there is no danger of their getting lost or mislaid.

As the opening of the hole into the slot is smaller than the ball, the ball cannot fall through.

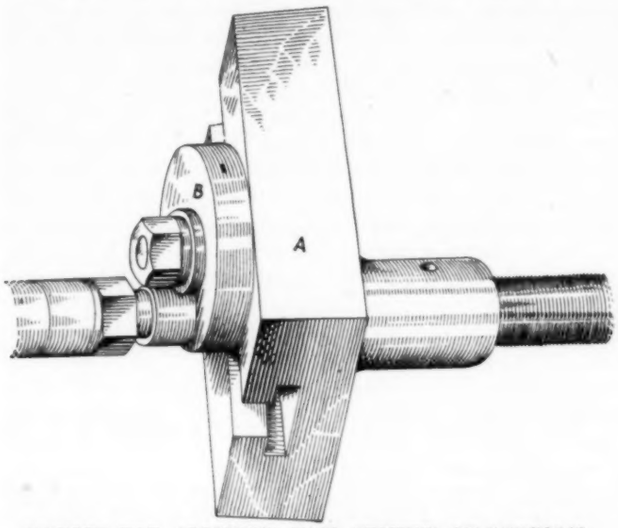
The method of holding a single pointed cutter is shown in Fig. 1, while Fig. 2 illustrates how a double ended cutter can be held.

Center-Aligning Device for Lincoln Milling Machine

By W. C. Adams

The sketch illustrates a device that I have applied successfully in many cases to overcome the difficulty not infrequently experienced in bringing the head and foot stocks of Lincoln milling machines into alignment. In the older styles of these well-known machines these two parts are separately adjustable, and unless skilled labor is employed in operating them the centers may be seriously out of alignment, with consequent trouble and spoilage of work.

In the sketch, *A* is a casting bored to fit over the tail



DEVICE FOR ALIGNING TAIL CENTER OF LINCOLN MILLING MACHINES

spindle, to which it is permanently fastened by means of a dowel or setscrew, or both. The face of this casting is machined and a T-slot milled through it at a right angle to the bore. The casting is fastened to the spindle with the T-slot in a nearly vertical position, though not necessarily exactly so.

A slide is made to fit freely in the T-slot and may be clamped in any position therein by means of a stud and nut. A disk, *B*, of hardened steel, fits over the stud in the same manner as a washer, and when the clamping nut is tightened it not only fixes the position of the slide in the T-slot but also clamps the disk against rotation. A hole is made near the edge of the disk to fit the pilot on the end of the cutter arbor.

When setting up the machine, the two spindles are adjusted to approximately the same level and tightened in the usual manner. The tail spindle is then moved forward by its screw and the disk and slide manipulated until the pilot on the end of the cutter arbor enters the hole in the edge of the disk; which is easy of accomplishment as at this time the slide is free to move up or down in the T-slot and the disk is free to turn on the stud. When the end of the arbor is entered in the hole a turn of the clamping nut tightens all parts in relative position.

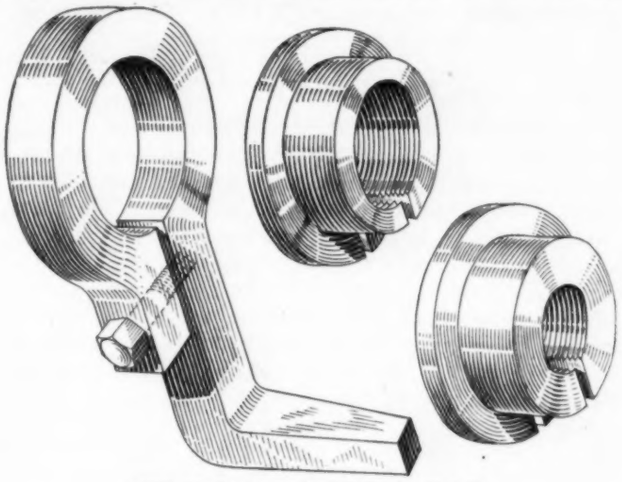
This device is of particular service in making minor adjustments of height, as by its use the arbor may be moved up or down for a considerable distance by merely loosening the clamping nut on the stud and allowing the disk to follow the position of the arbor as the latter is adjusted.

Clamp Dog for Holding Threaded Work

By G. A. Luers

The cut shows a lathe dog especially designed to hold work that has already been threaded without damage to the threads. It can be made up from any suitable piece of square sectioned stock.

After forging it to shape and tapping for the clamping screw the dog should be "swung up" on the faceplate of a lathe and the body bored and reamed smoothly to a standard size.



DOG TO HOLD THREADED WORK

Shouldered bushings are made to fit the various diameters and pitches of thread for which the dog is intended. The outer diameter of the bushings are all made to fit the bored hole in the dog, and they are slit lengthwise along one side.

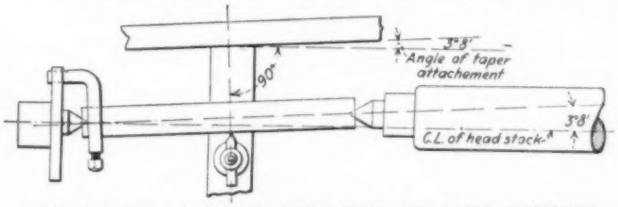
These dogs provide a firm grip upon threaded work and may be depended upon not to mar the threads. Smooth bored bushings may also be provided to hold polished shafts.

A Lead Compensator—Discussion

By C. G. Kranz

Referring to the article under the above title by Herbert M. Darling, published on page 65, Vol. 59, of the *American Machinist*, I herewith submit another way of handling the threading problem.

The taper attachment can be set to 3 deg. 8 min. (of



METHOD OF COMPENSATING FOR LEAD IN CUTTING THREADS

which the sec is 1.0015) and the tailstock set to bring the work parallel with the taper attachment, as shown in the accompanying sketch.

Should the irregular helix caused by the angular setting of the work and the driving by a dog be detrimental, a pair of narrow-faced bevel gears can be used for driving. One gear to be fastened to the lathe center and the other to the work.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors

September 27, 1923

The Machine Tool Builder and the Problem of Specials

IT MIGHT be thought that the problems of the machine tool builder discussed on this page during the last three weeks would be enough to keep any manufacturer occupied. Nevertheless we have one more to present, the matter of special sizes, equipment, parts, attachments and the like.

There is probably little profit in trying to place the blame for the existence of this problem on customer, dealer or builder. Each one contributes his share to the mess and the builder holds the bag.

The application of Secretary Hoover's simplified practice principles to the machine tool industry would undoubtedly solve the problem of the builders in short order but it would hardly satisfy the other parties at issue. Real manufacturing is as yet almost unknown in machine tools, the quantities produced are too small. Consequently it is hardly possible for a machine tool concern to adopt the attitude of most of the big automobile companies in refusing absolutely to accept orders for anything having the slightest variation from their standard product.

At the same time the filling of orders for special machines is an added expense for the machine tool builder just as it is for the automobile manufacturer although not to such a large extent. His production chain is broken just as is that of his larger contemporary. The expensive time of his administrative and engineering departments must be put in on the special job in addition to their work on the standard product.

No matter what the cost or the annoyance involved, special machines and attachments must be supplied by the machine tool people for many years to come. The average designer is more concerned with the correct functioning of his product than he is with making it easy to manufacture on standard equipment. Some attention has been paid to the latter feature in some of the more progressive shops where large scale manufacture is in vogue but there is still very far to go before the goal is reached.

As we see it, the fault of the machine tool builder has been in undercharging for work of a special nature. The customer fails to understand the expense involved in his demand. To him it seems like adding just a few more pounds of cast iron or steel to a standard machine and cast iron is certainly cheap enough. As a matter of fact it is so cheap compared to the other factors involved that the builder could well afford to make no charge for the raw material if he got a fair price for the skill and brains he has to put into the job. He *has* to get a fair price for the extra work entailed by special features if he is to stay in business and the customer must be brought to a realization of that fact.

New Demands for Railway Mechanical Executives

THE MECHANICAL executives of our railroads are confronted with many new problems. It matters little whether it is the superintendent of motive power, the master mechanic or the shop foreman, new problems are being presented every day on all progressive railroads. The problems of the executives differ, it is true, according to their work and responsibilities. But the new demands on motive power, the changes in locomotive design and the addition of new appliances make it very necessary that the mechanical department add greatly to its knowledge and experience.

Locomotives and rolling stock generally are getting heavier each year, which increases the problems of handling heavy driving boxes and other parts that were formerly moved by hand. The same is true of axles, crankpins and many other parts. Then, too, we now have alloy steels for connecting rods, crankpins, axles and the like, which not only affect machining operations but also require a knowledge of heat treatment as well, not forgetting the equipment necessary in both cases.

Steam pumps in place of injectors, stokers and boosters are all comparatively new mechanisms to be looked after. Then there are feed water heaters, superheaters and other appliances which are hardly machines and yet add work to the shop or roundhouse. The economical handling of these problems requires wide awake men, who must keep posted not only on the new locomotive equipment but on the best methods of repairing it and keeping it in service.

These demands will lead to the better and broader training of men all along the line. They will also give an added zest to the work of keeping these huge traveling power plants in first class order. And with proper management in the higher circles this change should result in securing a high type of man for railway shop executives, providing of course, the salaries are increased to compare with those in other positions of equal responsibility.

Men who want to keep abreast of the procession must study the best shop methods, not only in their own line, but in shops doing a somewhat similar class of work.

Mobilizing Industry for Emergencies

ALTHOUGH Congress in 1920 imposed upon the Assistant Secretary of War the duty of preparing plans for industrial mobilization, few of us have heard much about it. Considerable work has been done, however, by the fifty officers who were detailed to estimate the army needs in case of war. This inventory is now supposed to be complete for every branch of the service.

Practically the same staff is now investigating plant facilities with a view of knowing just what work can be done in different shops. With this data available, the work could be distributed so as to take a proportionate part of the productive capacity of all plants, rather than tie up some plants with war work and leave others idle or with only their regular product.

With this plan in operation the War Department hopes to eliminate the broker and middleman. It is giving special attention to the prevention of profiteer-

ing in all forms, believing it to be a fundamental principle of justice that one group should not profit while others give their lives or their health for the country's safety.

In order to prevent confusion and delay in an emergency it is proposed to induce Congress so to modify the plans regarding contracts that sample orders can be placed for special war material which is not commercial in any sense, at a price that will guarantee the manufacturer against loss. It is hoped to place small orders for munitions from time to time with a number of plants to be turned out according to specifications at their convenience but within a reasonable time. Such a plan would familiarize many plants with the peculiarities of such work and allow many mechanics to become acquainted with it.

It is believed that about three years will be required to secure a complete survey of the manufacturing facilities of the country, but when it is done the War Department will have data which will enable it to secure supplies of all kinds very quickly. Allowance is, of course, being made for changes which take place in plants and it is realized that such a list must be revised constantly to be of real service.

There is one point which seems to have been overlooked, or which at least is not made clear. We refer to the design of military apparatus with a view to its economical manufacture. With the design goes the question of tolerance and gaging, both absolutely essential if we are to secure any mechanisms rapidly and at a low cost.

Unfortunately few men who design guns, ammunition or other war material know anything of economical manufacture. Many of the designs are extremely difficult to machine and are given tolerances which are entirely unnecessary to secure proper functioning. The average designer of guns insists on making every part from a steel forging, which frequently involves unnecessary machining.

The War Department can take a great step toward securing munitions quickly if it will have men who thoroughly understand modern production, go over its designs with competent army engineers. In this way many unnecessary operations and much needless expense can be saved, both in such preliminary work as is proposed and in any emergency which may arise.

Proper functioning of a piece must always be the first consideration. But the elimination of tolerances which are needlessly close and the modification of design in accordance with the best machine practices will be a long step forward in real preparedness.

Federal Air Law Coming

THE need of a Federal air law has been pointed out many times and it is gratifying to note that more interest is being shown by various bodies in its enactment. The American Bar Association has indorsed the bill known as H.R. 13,715, introduced by Hon. Samuel Winslow at the fourth session of the 67th Congress.

The bill in question, known as the Civil Aeronautics Act of 1923, was prepared with the assistance of representatives of both governmental and civil aviation to establish a Bureau of Civil Aeronautics in the Department of Commerce and provide a basis for a Federal Air Code.

"Prolonged delay in enacting Federal Air Law," says a statement from the Aeronautical Chamber, "has been deplorable for three reasons. First, there has been needless loss of life and property on account of lack of proper certification of airworthiness of aircraft and competency of pilots. Second, the normal growth of a new and essential industry and utility has been arrested—insurance rates are high, and capital naturally is reluctant to flow into a business lacking proper legal status. The third reason—keenly realized by our War and Navy Departments—is that, as long as the growth of commercial aviation is delayed, just so long will our national defenses be impaired and the ultimate cost of restoring them be increased."

It is presumed that the equivalent of H.R. 13,715 will be introduced and passed immediately the new Congress convenes.

Have We Overlooked a Field for Machine Tools?

A LETTER from a reader who speaks with a feeling due to sad experience, points out what may be a new field for the makers of grinding machinery. According to the fond parent who writes us, the largest manufacturer of baby carriages, perambulators or buggies, depending in which part of the country you reside, sends out his product with turned axles, and rough turned at that. To add to the troubles of the aforementioned fond parent, there is a deep tool groove that tends to force the wheel against the clip which acts as a nut to keep the wheel from parting company with the axle, and rolling off on a journey all its own.

Anyone who isn't too old to remember when he trundled his own heir apparent over the bumpy sidewalks knows they were not frictionless. And if the hardy muscles of the stronger sex tire when the wheels turn hard, what of the average overtired mother with her precious, as she goes to market or elsewhere?

Then, too, we are told that the clips wear out or slip off, leaving nothing but moral suasion to keep the wheel in place. When this fails, and the mother has to push a three-legged carriage, home isn't all it might be until she cools off and recovers her poise.

With these facts staring them in the face it behooves the builders of grinding or other machines to come to the rescue and show the makers of baby vehicles how the bearings should be finished. Rough turning and deep grooves are as much out of date as the Indian method of carrying babies on the mother's back. Nor is it as small a field as might be supposed. For while in dull times big brother's baby buggy may be handed down to the new sister, nothing but famine, pestilence and earthquakes interferes with the supply of occupants for these vehicles.

The pushers of baby carriages, be they the fond mother, the proud father or the doting grandmother, are looking to the machine tool builders to improve the pushing qualities of their favorite vehicle. They will, we are sure, not be disappointed, when the members of the N.M.T.B.A. realize their opportunity.

Shop Equipment News

Gleason 8-Inch Bevel Gear Generator

An 8-in. bevel gear generator, for producing straight bevel gears on a mass production basis, is now being marketed by the Gleason Works, Rochester, N. Y. This is a single purpose machine and is different in appearance from the universal type of machine, although the same basic principle of generating the tooth is still used. The machine is shown in Fig. 1.

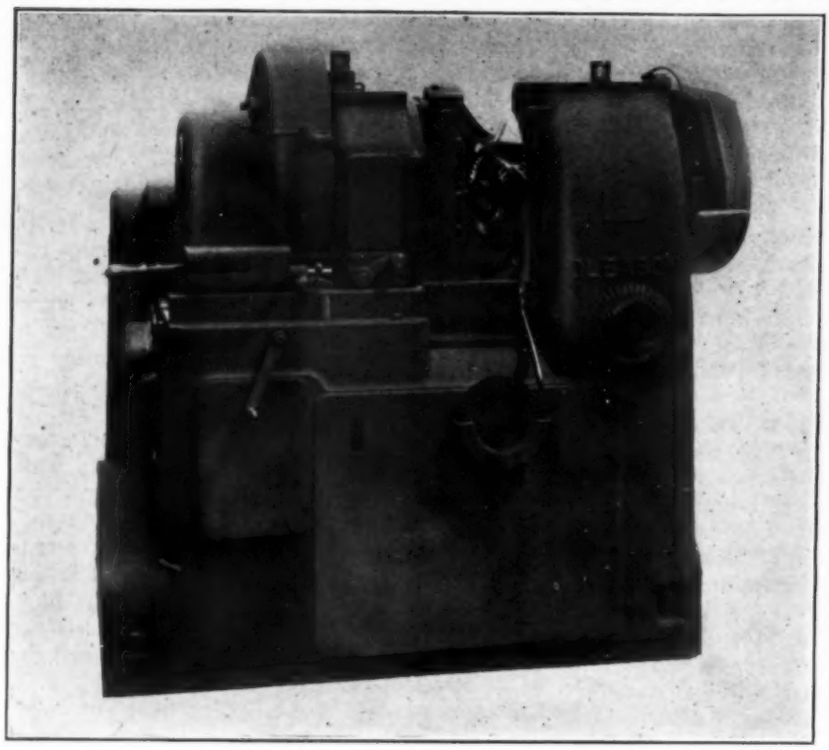


FIG. 1—GLEASON 8-IN. BEVEL GEAR GENERATOR

The tooth contour is developed by rolling the work and the tools relative to each other at a uniform pitch line velocity. The tools represent the adjacent teeth of a crown gear and, as they reciprocate, cut away the stock on the work, developing correct tooth profiles. The generating motion is obtained by a crown gear and segment, the generating roll being on the work-holding member.

The index is of the notched plate type operated by the generating roll, the index plates being hardened and ground.

The tool carrying unit is mounted on an upright which, instead of swinging about a center, is given a lateral movement by a cam to obtain the feed of the tools to the work. This arrangement permits the whole unit to be securely gibbed with simple adjustments for taking up the wear.

The clapper box is integral with the slide and the tool holder and clapper block are made of steel, the tool holder being hardened and ground. The relief movement for the tools during the return stroke is mechanically operated and positive in its action.

The amount of movement necessary for the relief of the tools is small, because the swivel pins on which the clapper blocks swing are behind the cutting edge of the tools, and almost in line with their travel. This small movement makes the machine quiet and steady in operation and, as the drive for the tools is arranged to have the effect of a draw cut, high tool speeds can be maintained with little vibration or noise. It is stated that the work produced has a very smooth and satisfactory finish.

The tool carrying slides are arranged to overrun the arms at both ends so that long continued operation on any one job will not wear a depression in the bearing surfaces of either part. One large gib on each slide takes up the wear for all directions. The tools are the same as those used on the 11- and 18-in. machines.

Every point on the machine requiring lubrication is oiled by a pump lubricating system, and there

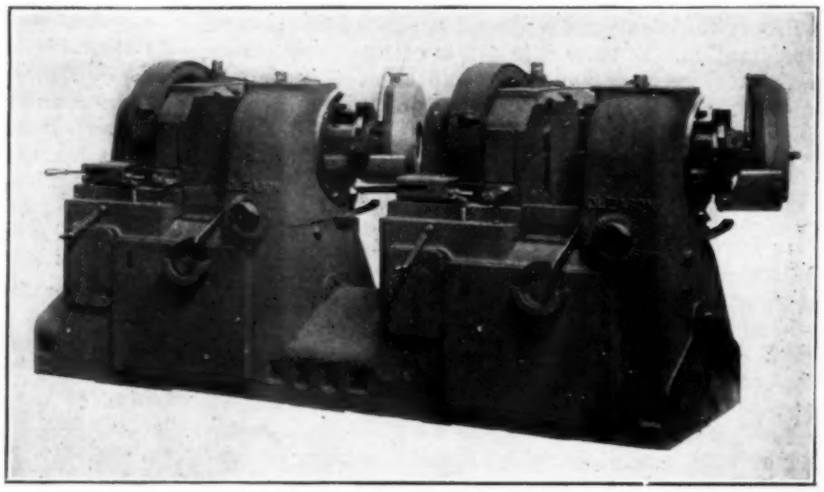


FIG. 2—TWO GLEASON GEAR GENERATORS IN A BATTERY

are two points for inspecting the oil flow in sight of the operator. Not only the rotating bearings but also the tool slides, hand adjustments, and such points as index plate notches and ratchet pawls are reached by this central oiling system. This system of lubrication is a feature of the machine.

The chips drop into a basket which, when full, may be tipped to drop the chips into a lower basket which may be removed at any time and dumped.

The lever control for starting is sensitive and the tools can be "inched" along if desired. When the machine reaches the reloading position, an automatic stop shuts down the machine by throwing out the friction clutch.

Two machines set up in a battery are shown in Fig. 2. The surfaces where the machines come together are planed parallel so that the joints will be true and tight. When set up in a battery, repair work or replacement of parts on any portion of the machines can be made without moving them.

The machines shown in the illustrations are arranged for motor drive, the motor being located at the back and driving the main drive pulley through a belt. A 3-hp. motor is required. The heavy rim of the main drive pulley gives considerable flywheel effect which is advantageous when starting. The power is transmitted to the main shaft of the machine by a friction clutch.

The work head, designed for differential gear and pinions, can be arranged to handle any such parts having a pitch angle between 29 and 61 deg. Each gear requires a crown gear and segment corresponding to its pitch angle, and an index plate for the number of teeth. The time for generating one tooth varies between 4 and 30 seconds.

The floor space required for the belt-driven machine is 54x44 in., the width being increased for motor drive by an amount depending on the motor used.

Buffalo 21-Inch Geared Drilling Machine

The Buffalo Forge Co., 490 Broadway, Buffalo, N. Y., is now marketing a 21-in. geared, upright drilling machine with gear-driven feed. The machine is of similar design to the 25-in. size, described on page 39, Vol. 51, of the *American Machinist*.

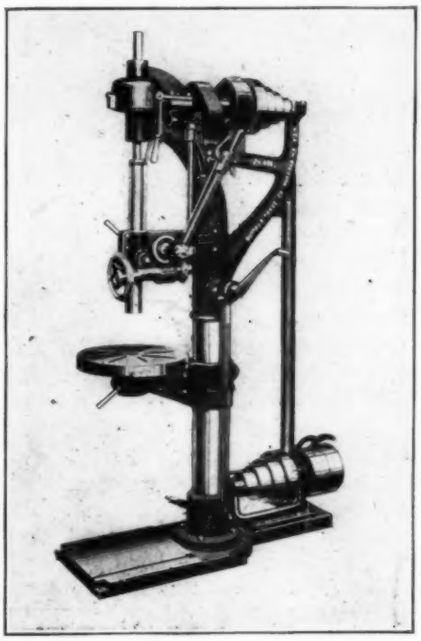
The noticeable departures from the former type are the use of a positive gear feed, and a frame brace between the lower pulley shaft and the upper part of the frame. The machine can, however, be furnished without the brace if desired.

By the use of back gears the machine has eight spindle speeds. The feed is operated by handwheel, ratchet lever or power. Three power feeds are available and all feeds may be obtained without stopping the machine. An adjustable trip is provided by which the power feed is automatically disengaged when the work has been drilled to the required depth. The main feed worm runs in an oil bath.

The back gears may be quickly engaged by means of a hand lever, after disengaging a knob in the driving gear. A lock screw holds the hand lever in place. All gears are enclosed and are bronze bushed.

The spindle is made of high carbon steel and accurately ground. The spindle thrust is carried on ball bearings, and the plain spindle bearings are split. The spindle has 12½ in. vertical travel, the maximum distance from the spindle to the base is 39 in., and from the spindle to the table, 22 inches.

The table is raised and lowered by a hand operated screw. The table arm is bored by the machine itself. The round table is 16½ in. in diam.,



BUFFALO 21-IN. GEARED DRILLING MACHINE

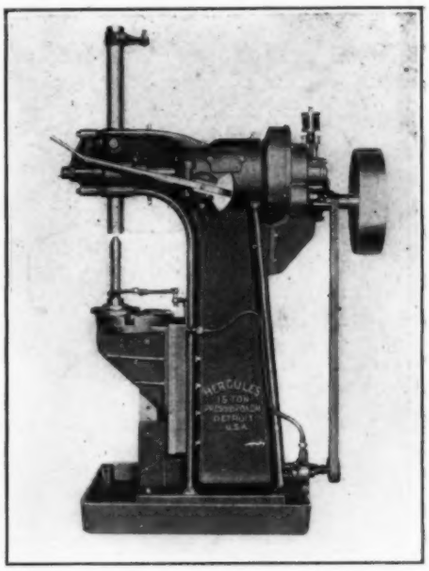
and the base is provided with T-slots for holding work. A tapping attachment can be furnished if desired.

The capacity of the machine is up to 1½-in. holes. The floor space required is 16x47 in., and the weight is 970 pounds.

Hercules Power and Broaching Press

The combination power and broaching press manufactured by the Hercules Mfg. Co., 446 E. Woodbridge St., Detroit, Mich., has recently been redesigned and the later model is now being marketed. The former machine was described on page 478, Vol. 53, of the *American Machinist*.

Power is delivered to the ram



HERCULES POWER AND BROACHING PRESS

through a series of steel gears and a double friction clutch, by means of which any pressure up to the capacity of the machine may be obtained. The capacity of the press is 15 tons. The ram is 36 in. long and 3 in. in diam., and the length of travel is 24 inches.

The fast speed of the ram is 50 ft. per min. up or down, the pressure feed downward being 84 in. per min. All speeds are controlled by one lever.

Broaches for this press are made with 60 deg. ends which fit in an adapter on the end of the ram. The machine is furnished with either belt or motor drive, and has an oil reservoir in the base with suitable pump and piping. The floor space required is 54x30 inches.

Gray Twin-Rail Long Reach Planer

The G. A. Gray Co., Cincinnati, Ohio, has recently placed on the market a twin-rail, long reach, heavy service planer which is intended for work requiring a longer reach than is available with the regular planer, combined with very heavy cutting.

As will be noted from Fig. 1, the rail is built up of two members securely bolted together and moving as one unit. The saddles have a solid bearing against the bottom of the lower member, an adjustable gibbed bearing on its top surface, and a supplemental bearing against its rear face. In addition, the saddles also have an adjustable gibbed bearing against the rear of the upper member of the rail. The top

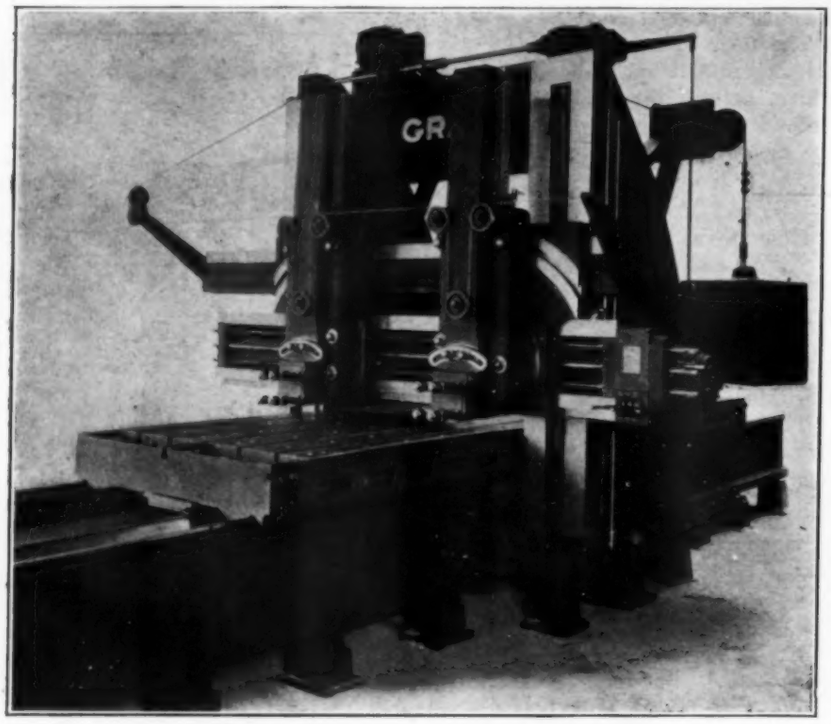


FIG. 1—GRAY TWIN-RAIL LONG REACH PLANER

and bottom bearings of the saddle are thus localized on the lower member, thereby securing the advantages of a narrow guide, while the bearing against the rear of the upper member gives the stiffness required by the long reach.

Three ball bearing rollers are provided in the top of each saddle, so that most of the weight of the heads comes on the upper rail member. This obviates deflection of the lower member, which remains straight and true, so that the head always moves parallel to the table top. At the same time the effort of moving the head is so reduced that the operator can easily set the head with the ordinary crank from the end of the rail.

The ram carriers can be swiveled on the saddles, and are bolted not only to the lower portion of the saddles, but also to a supplemental support near the top of the saddles. The steel tool boxes are mounted on the lower ends of the rams. The rams have rapid traverse as well as hand and power feed through the ram carriers. As the ram carriers can be swiveled, the rams have automatic feed in any direction.

To swivel the heads quickly, a simple and efficient method is employed. As shown in Fig. 2, a bar is slipped over the collars provided on the heads. The left-hand ram carrier is then loosened and the right-hand head is moved by the power traverse. This causes the left-hand ram carrier to swivel. Having secured an approximate setting with the power traverse, the operator can get an accurate setting by moving the head with the hand crank. He can then clamp the left-hand carrier, loosen the right-hand one, and swivel it to the desired angle by moving the left-hand head.

"Twin-purpose" taper gibs add to the rigidity of the heads while cutting. One of these gibs is provided between the ram and ram carrier. A turn of the handle in one direction positively adjusts the gib to the operating position, while a turn in the other direction securely locks the ram carrier throughout the entire length of the carrier. A similar gib is provided between the saddle and the rail.

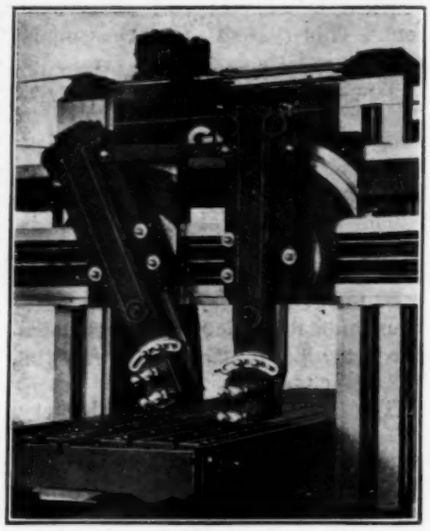


FIG. 2—METHOD OF SWIVELING HEADS ON GRAY PLANER

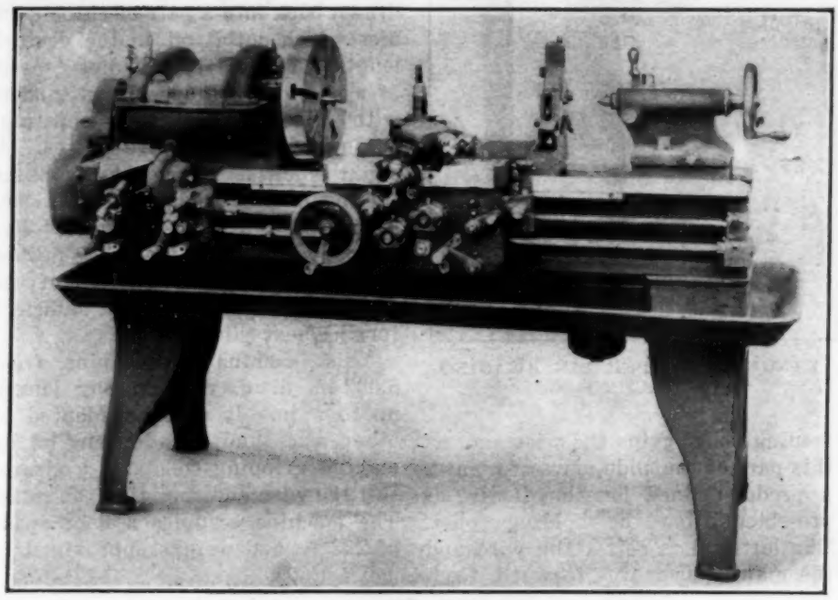
The rams and heads can be traversed by power by means of the usual single shift rapid traverse that characterizes the regular line of Gray maximum service planers, and which has been previously described on page 894, Vol. 55, of the *American Machinist*.

This planer is also equipped with the usual balanced helical driving system running in oil. Both the lower and upper members of the rail are clamped to the inside of the housings by independent rail locks. The rams and rail are independently counterbalanced and move easily. The table is provided with steel hold-down gibs, running its entire length and automatically oiled from the constant pressure forced lubricating system that oils the Vs. The bed is double length, so that the table never overhangs.

The bed weighs 14 tons, table and rack 10 tons, the housings 6 tons, the rail 6 tons, and the top brace 1 ton. In spite of this great weight, it is claimed the planer can be operated as easily and quickly as a small planer of the regular type. The capacity of the planer is 66-in. width, 44-in height, and 16-ft. length.

American 12-Inch High Duty Engine Lathe

The 12-in. high duty lathe, shown in the accompanying illustration, has recently been added to the line of machine tools manufactured by the American Tool Works Co., Cincinnati, Ohio. The lathe is built in four bed lengths ranging from 5 to 10 feet.



AMERICAN 12-INCH HIGH DUTY LATHE

A single back geared head, a quick change double back geared head, or an automatically oiled geared head can be furnished. The single back geared head provides 8 spindle speeds, and in the double back geared head 9 spindle speeds, both forward and reverse, are available. The change from second back gear to first back gear speeds is practically instantaneous through friction clutches that are self-adjusting for wear.

The geared head provides 12 spindle speeds in geometric progression, covering a range from 12 to 450 r.p.m. All gears in the head are steel, and all speed change gears are of alloy steel, heat-treated and hardened.

A range of 43 threads and feeds is provided. They are listed on a direct-reading index plate above the tumbler lever. The quick change gear mechanism forms a complete unit in itself and is fixed to the bed by means of a tongue and groove for permanently accurate alignment. All compounding in the feed box is done by taper jaw clutches.

All quick change gears are regularly made from 0.045 carbon bar steel. The cone gears are cut with Brown & Sharpe 20-deg. involute cutters, which form a pointed tooth slightly rounded at the top.

The lead screw is 1¼ in. in diam. and has a thread of ⅛ in. pitch. The apron is made with the double wall section, which gives an outboard bearing for important studs and shafts. The rack pinion is heat treated and has stub teeth. A thread dial is regularly furnished.

The tailstock is of the two-bolt design, the rear bolt being carried to the top for convenience in clamping, and a double plug binder is arranged to clamp the tailstock spindle at any position without affecting its alignment.

The headstock spindle is made from a special hammered crucible steel stock. The spindle bearings on the cone-head lathes are lubricated by sight feed oil cups, the geared head being lubricated by an automatic oiling system. In this system the oil is pumped from a reservoir in the head to a filtering and distributing tank in the head cover, from which it flows by gravity through pipes to the various bearings.

This lathe swings 14½ in. over the bed and 8½ in. over the compound rest slide. The distance between centers with the 5-ft. bed is 28 in., and the hole through the spindle clears a 1¼-in. bar. The geared head driving pulley speed is 340 r.p.m., the diameter of the pulley being 10 inches.

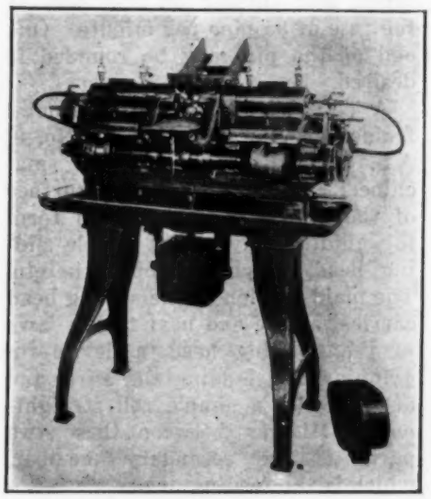
Motor drive can be furnished with the gear head lathe and the motor is regularly mounted on the head, driving the initial shaft through gears. A double friction countershaft is supplied with belt-driven lathes.

The regular equipment includes compound and steady rests and large and small faceplates. Other equipment such as taper, draw-in and relieving attachments, etc., can be furnished.

Grant Double-end Threading Machine

The Grant Mfg. & Machine Co., 90 Silliman Ave., Bridgeport, Conn., has placed on the market a machine designed for the purpose of threading both ends of small rods simultaneously. It will handle rods up to ⅜ in. in diameter and 9 in. in length. The threading is done by means of self-opening dies on opposed spindles.

The machine is entirely automatic in its movements, taking the rods from a hopper and discharging them when completed into a chute at the rear. The spindles are gear driven from a single shaft, fitted with a two-step cone pulley to receive the belt from a countershaft. The automatic features are actuated by cams upon a shaft that extends over the full length of the machine at the front, where they are easily accessible for the purpose of adjustment when changing diameters and lengths of work. The cam-shaft is driven through change gears.



GRANT DOUBLE-END THREADING MACHINE

The cams from which the forward and back movement of the sliding heads is derived are so constructed

that, in combination with the change gear train, the rate of movement of the heads may be made to synchonize with the lead of the thread being cut. The cams thus act as lead-screws to relieve the dies of the duty of moving the heads as they advance over the work.

The spindles are hollow and serve to convey a flood of oil or cutting compound to the dies. The fluid is delivered to the outer ends of the spindles through flexible tubes by a chain-driven oil pump.

The driving gears are enclosed and run in oil, and the dies are amply guarded to prevent oil from flying about. The machine stands in a pan which collects the oil and returns it through a strainer to the reservoir beneath. The reservoir swings upon trunnions and is easily accessible for cleaning.

The floor space occupied by the machine is approximately 2 x 5 ft., and the net weight is 1,000 pounds.

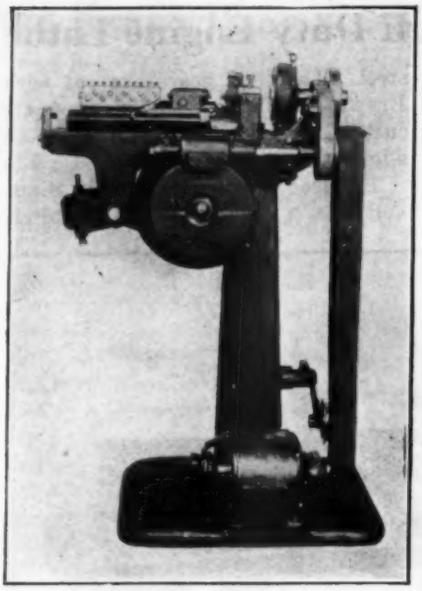
Langelier Taper Pin Swaging Machine

The Langelier Mfg. Co., Providence, R. I., has just completed and placed on the market a machine for making small taper pins by the swaging process. It is automatic in its operation, taking the wire from a coil, straightening it, swaging the taper, and cutting off the pins at the rate of 35 pins per minute. One end of the pin may be rounded if desired.

A pedestal supports a horizontal frame carrying at one end a No. 0, A.S. type, Langelier swaging machine. The remaining upper surface of the frame is machined to form the guiding ways for a double sliding head, which is gibbed thereto. The main portion of the sliding head carries, at the end next to the jaws of the swaging head, a device for gripping and holding the wire, and at the other a simple roll straightener. Midway between these two parts is the secondary member, which is the feeding device.

The two parts of the sliding head derive their movement from face cams upon the worm wheel below the frame, and though both move in the same direction at a given point of a cycle, the feed slide precedes the main slide by a definite amount. Both the holding and the feeding devices are made somewhat after the fashion of a spring collet.

At the beginning of a cycle the



LANGELIER TAPER PIN SWAGING MACHINE

feeding collet grips the wire and, as this part of the slide moves forward, a predetermined length of wire is projected from the holding collet. The latter then seizes the wire and the main slide moves forward, feeding the projecting wire to the swaging dies. When the swaging is completed the main slide recedes far enough to bring the finished pin, still attached to the wire, out of the dies. It then stops and releases its hold.

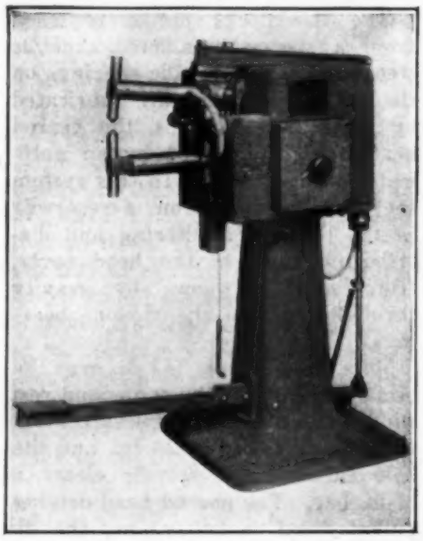
The secondary slide continues its movement until the swaged pin is drawn back into a pair of cutting-off dies which cut it off to the desired length. The cutting-off dies consist of a pair of bushings placed tandem with the cutting faces abutting, through which the wire passes. A slight sidewise movement of one of the bushings, produced by a cam, severs the pin from the wire. The next advance of the feed slide pushes the completed pin out ahead of the wire and projects a length sufficient for the next pin.

This machine makes pins from 0.032-in. diam. wire in any length up to ½ in. It may be adapted to other sizes and greater lengths by making gripping collets of a size to suit the wire and changing the cams. The machine occupies a floor space of 2x3 ft. and weighs approximately 900 pounds.

Thomson Model-100 Spot Welder

The Model-100 spot welder has recently been added to its line of welding equipment by the Thomson Spot Welder Co., Lynn, Mass. Several improvements over former equipment have been incorporated in the latest design.

As shown in the illustration, the machine is operated by a pedal which actuates the mechanism through a coiled spring on the vertical link. When properly adjusted, it is stated that the operator cannot apply the current until pressure has first been applied to the electrodes. The current is automatically cut off through further pressure on the foot pedal, after the material has reached the proper heat. The switch is quickly adjusted for various pressures.



THOMSON MODEL 100 SPOT WELDER

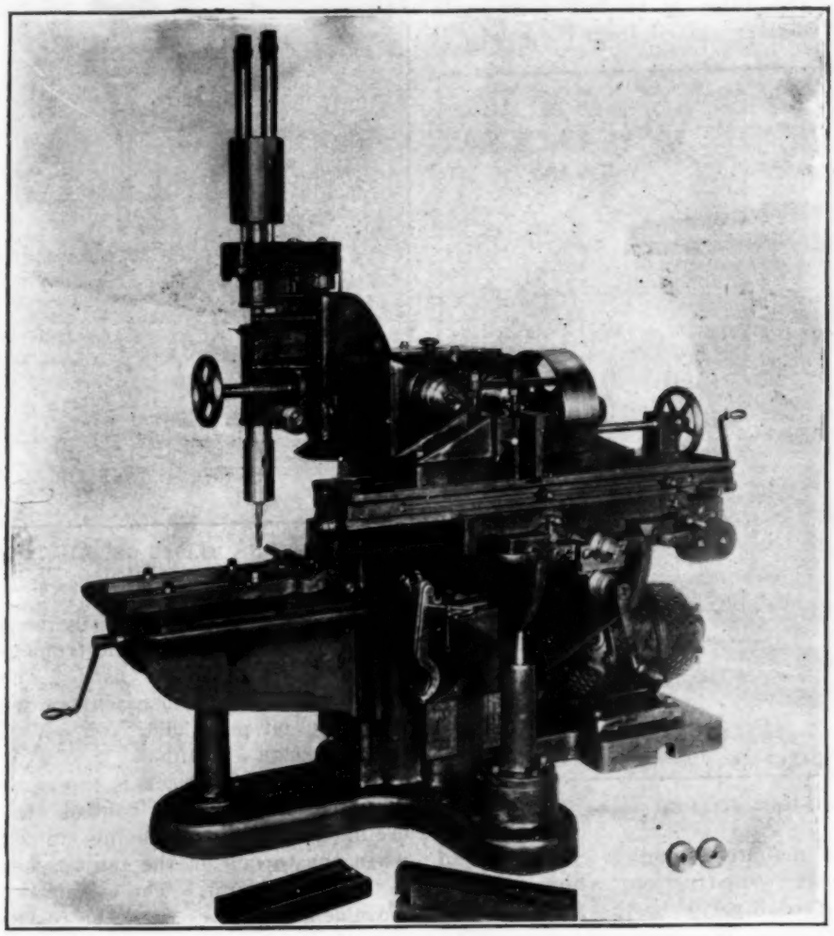
The primary coil is built to stand high temperature, so that the machine may be used for continuous production or operated at an overload. The transformer is of the "split-core" type which makes possible the removal of primary coils without dismantling the transformer. The capacity of the transformer is 25 kw. An improved design of secondary lead and terminal connections has been installed.

The standard length of horns is 12 in., but either 18- or 24-in. horns can be furnished. The horns are water cooled and may be used in raised or lowered positions. The maximum drop of the horns is 9 inches.

The machine will weld two pieces of steel $\frac{3}{32}$ in. thick or two pieces of brass or aluminum $\frac{1}{8}$ in. thick. The floor space required is 48x20 in., and the height is 50 in. The net weight of the machine is 1,000 pounds.

Harrington Wedge Block Slot Milling Machine

A machine designed especially for machining the T-slot in locomotive driving box adjusting wedges, is now being marketed by the Harrington Co., 17th and Callowhill Sts., Philadelphia, Pa. As shown in the accompanying illustration, the tool is a combination drilling and milling machine.



HARRINGTON WEDGE BLOCK SLOT MILLING MACHINE

One side of the machine is equipped with a drill spindle provided with hand and power feed and an automatic trip. Two holes on close centers are drilled in each wedge block, and the block to be drilled is placed between the guide strips and pushed back against the first of the adjustable end stops. This stop is adjusted so as to properly locate the first hole. After the first hole is drilled the first stop is raised, and the wedge block is pushed back against the second stop for drilling the second hole. The two holes can be seen in the wedge block on the floor at the left.

The milling side of the machine is provided with two parallel spindles, running at different speeds and driven by spiral gearing flooded by a bath of oil.

The milling table knee has a vertical adjustment, and carries a compound table which can be moved in and out parallel to the axis of the spindles and also transversely, at right angles to the axis of the spindles. The transverse motion is secured through power feed, and an automatic trip for stopping the feed at any predetermined point is provided.

A specially designed vise, which holds the wedge blocks with a narrow edge uppermost, is mounted on the table. The sliding jaw is quickly clamped by a hand wheel and screw, and a clamp over the top of the jaws can be used to prevent the work from raising. The depth of the T-slot is set by means of an adjustable stop.

The left hand spindle, rotating rapidly, drives a straight end mill, and the slowly rotating right hand spindle drives a T-slot cutter so that both cut at about the same surface speed.

The table is fed from left to right. The end mill first removes the metal left by the drilling operation and the T-slot is then cut in as the work is fed towards the right.

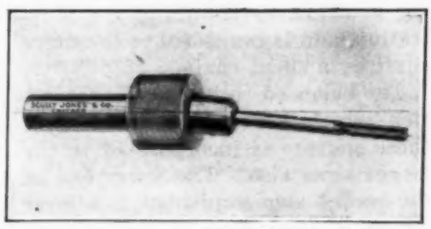
The machine is built with a base extension for mounting the motor, which is belt-connected to the machine. The motor should preferably be of the adjustable speed type to give a range of spindle speeds for cutting different materials. Four feeds can be obtained by means of constant-center change gears.

It is claimed that the use of this machine materially reduces the cost of production as well as increases the output per man-hour. The machine is so compact that comparatively little floor space is required.

Scully-Jones Self-Aligning Reamer Holder

A self-aligning reamer holder for use in turret lathes and drill presses has recently been developed by the Scully-Jones Co., 2012 West 13th St., Chicago, Ill., and is now being marketed. The holder is intended to make it possible to obtain the accuracy of hand reaming with machine power, the construction of the holder being such that the reamer can shift sideways as well as swing at an angle in any direction in order to align itself with the work.

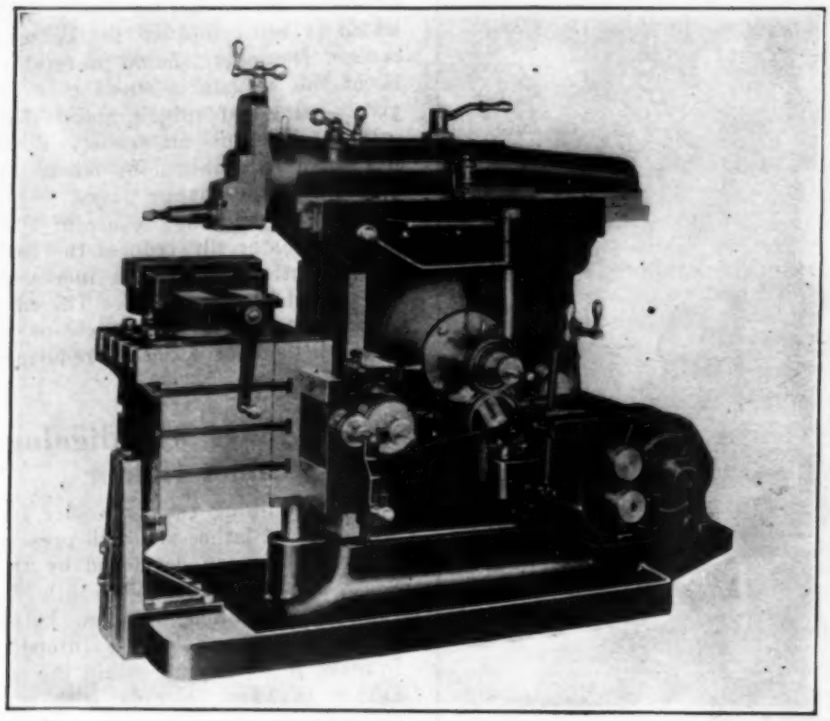
The reamer is held in a collet that is controlled through a driver plate and universal joint, the drive plate being supported by a ball that allows the collet to swing freely in any direction. A ball thrust between the collet and the drive plate allows free movement of the reamer sideways, to conform with any angular irregularities in the alignment of the machine spindle with the work. All parts are of hardened steel, nicely finished.



SELF-ALIGNING REAMER HOLDER

Averbeck Balanced-Ram Shaper

The Steel Products Engineering Co., Springfield, Ohio, has recently added a 28-in. and a 32-in. size to the line of Averbeck shapers which it manufactures. In addition to this, the 20- and 24-in. sizes formerly made only with cone pulley drive, are now furnished with the single pulley, constant speed drive used on the larger shapers, and all four sizes may be motor-driven.



AVERBECK BALANCED-RAM SHAPER

The single pulley drive mechanism includes a selective type gear box, by means of which eight cutting speeds are available, ranging from 6 to 103 strokes per min. For motor drive the motor is mounted on an extension of the base at the rear of the machine, as shown in the illustration, and is connected to the drive shaft by a silent chain.

The balanced rocker arm construction which has been a feature of these shapers is incorporated in the larger sizes also. The lower end of the rocker arm is pivoted to a lever which is fulcrumed in the column, the opposite end carrying a counterweight. This arrangement is intended to counteract the weight of rocker arm and ram upon the ways and thereby reduce friction.

The ram is of heavy, braced construction, internally ribbed, and has long wide bearings with full-length gibs for taking up wear. The usual stroke adjustment is provided. The tool head swivels through an angle of 160 deg. and is suitably graduated. The tool slide has a taper gib and is fitted with a locking device. The feed screw carries a double collar, one keyed to the screw and the other a slip collar graduated in thousandths.

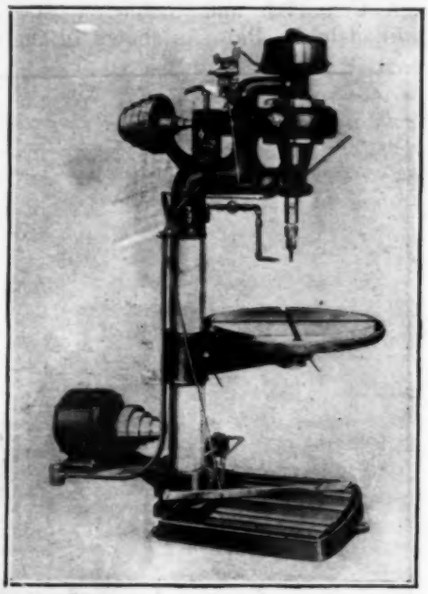
The table is of box form with T-slots machined from the solid. It is mounted upon a cross rail of heavy construction, which may be bolted directly to the frame of the machine to secure extra rigidity. The elevating screw for the cross rail is of the telescoping type. The outer bearing for the table consists of a casting with a vertical slot, in which a bracket carrying a roller may be set. The height of the roller is adjusted so that it is in contact with the outer edge of the table.

A heavy-pattern vise is provided which has a graduated swivel base of large diameter. The vise can be clamped on both sides of table as well as the top.

The power cross feed provides 16 feeds ranging from 0.008 to 0.125 in. per stroke. Two adjustable dogs are arranged to stop the feed action at any desired point in either direction, and stationary stops disengage the mechanism at the extremes of table travel. A 2 to 1 quick return is also provided.

Gaterman Pneumatic Oscillating Tapping Machine

A pneumatic control for the oscillating motion of the tapping machine manufactured by the W. Gaterman Mfg. Co., Franklin and 15th Sts., Manitowoc, Wis., has recently been developed to replace the electromagnetic control formerly used. The electrically controlled machine was described on page 980, Vol. 55, of the *American Machinist*.



GATERMAN PNEUMATIC OSCILLATING TAPPING MACHINE

The oscillating action is the same as with the electric control, the oscillations of the tap being started when the torque on the tap reaches a desired amount. The oscillating movement continues until the resistance is overcome, but it does not occur unless the resistance offered by the work exceeds the torque for which the driving mechanism has been set. The desired amount of torque is set by the spring balance in the head.

It is claimed that tap breakage is greatly reduced by the use of this machine and that the speed of tapping is increased. It is especially adapted for rapid work in tapping blind holes.

It is said that the pneumatic control delivers greater pressure on the clutches than the former control so that the capacity is increased.

The machine is built in different sizes, the No. 8 having a capacity from ¼ in. to ⅜ in. A suitable air compressor for plants where compressed air is not available can be furnished.

News Section

A. S. M. E. Machine Tool Research Committee Meets

On Tuesday afternoon, Sept. 18, in the Mason Laboratory at New Haven, the members of the special committee on research in the machine tool industry, of the American Society of Mechanical Engineers got together for their first meeting. B. F. Blood of the Pratt & Whitney Co. was elected chairman and C. B. LePage, assistant secretary of the society, acted as temporary secretary.

After considerable discussion the form and substance of a progress report to be made to the society at the annual meeting in December were decided upon. The report is intended to cover the present status and future problems of the art of cutting metals.

Those present were A. E. Bellis, president, the Bellis Heat Treating Co., New Haven; B. H. Blood, general manager, the Pratt & Whitney Co., Hartford; K. H. Condit, editor, the *American Machinist;* E. F. DuBrul, general manager, the National Machine Tool Builders' Association; M. D. Hersey, physicist, the Bureau of Mines; L. H. Kenney, the U. S. Navy Yard, Philadelphia; and Prof. Boston of the University of Michigan and Mr. Yamasaki of the Imperial Japanese Navy who sat in as guests.

New Ford Truck Is Contemplated

A two and a half ton truck with a Fordson engine is expected to be added to the Ford Motor Co.'s line late this year. At present executives are not prepared to discuss plans for this new model, which are held in abeyance pending the introduction of the new one ton truck, equipped with cab and body, deliveries on which will start the latter part of this month or early in October. Present indications are that the heavy truck also will be built complete with body so as to allow of low delivery costs of a complete vehicle to the purchaser. As in the case of the light truck, there will be a standard convertible body. For requirements where the standard body would not be suitable the purchaser will consult, as formerly, the commercial body builder.

Canada Exporting Many Autos

That Canada now leads any other British country in its export of automobiles is shown by figures for the twelve months ended August, compiled by the Bureau of Statistics. The total exportation of freight and passenger automobiles for the twelve month period was 61,543 valued at $31,241,727 as compared with 26,549, valued at $14,885,844 in the corresponding period last year.

The total shipment of passenger automobiles for the twelve month period ended August was 53,520 valued at $28,344,700 as against 24,600 valued at $14,001,980 in the same period last year. Freight automobiles exported during the twelve month period totalled 8,023 valued at $2,897,027, compared with 1,949 valued at $883,864 in the preceding twelve months.

In August this year 4,245 passenger cars valued at $1,731,776 were sent out of the country as compared with 2,716 valued at $1,586,924 in August, 1922. There was also a considerable increase in the August exports of freight automobiles which totaled 1,480 valued at $521,118 as against 133 valued at $57,798 in the same month last year.

The total value of automobile parts exported during the twelve month period was $3,379,670, compared with $1,407,644 in the same period last year. August exports of automobile parts totalled in value $286,456 as against $134,105 in the corresponding month last year. The United States was the best customer for automobile parts, the value of the exports to that country being $64,537.

Coal Report Is Presented

In its final report on the coal situation presented to President Coolidge, the Coal Commission, headed by John Hays Hammond, recommended that a division in the Interstate Commerce Commission be created to exercise administrative and quasi-judicial functions over the coal industry, such as the gathering of facts and other activities essential to protect the public.

The report is to a great extent an elaboration of previous expressions of the commission, but it touches upon the terms of the strike settlement negotiated by Governor Pinchot, and asks the question whether the operator, carrier and distributor will absorb the 10 per cent wage increase. It also attacks the Pennsylvania tax on anthracite coal and suggests an excess profits tax to reach the hard coal operators.

No Anthracite Competition

"The fundamental evil in the anthracite industry is that of monopoly—the treatment of limited natural resources as if they were like other private property," it says. "Reliance on competition without supervision has resulted in persistence on a permanent level of high prices above which extortionate increases were made whenever a suspension of mining or other disturbances gave rise to the phenomenon of premium coal. In the anthracite industry, we have secured stability—which is desirable—but it has been at high cost to the consumer and has made anthracite a luxury fuel. The public is just now concerned as to whether the increase of 10 per cent in the wages of anthracite miners is to be 'absorbed' by operators, carriers and dealers, or passed on to consumers, just as it was outraged by the abnormally high prices of last Winter. But as shown in the report on anthracite, underneath these exceptional surface fluctuations there is a rising flood of costs and of prices which does not recede with the fall in the prices of commodities in general.

Urge Wage Revision of Miners

"The special report on anthracite discloses that there are such inequalities in the wages of miners as to require a thorough revision of the entire wage scale, some miners obtaining wages much higher than are paid in other comparable occupations, while others fall far short of what is needed to furnish a living American standard. It discloses that, together with these relatively low wages and unsatisfactory living conditions of many of the miners, including those who derive least benefit from the recent 10 per cent increase in wages, there are excessive royalties and differential profits. Limitation of margins to a reasonable return on legitimate investment and the elimination of monopoly profits, whether in the form of royalties, operators' and dealers' margins, or freight rates, are perfectly reasonable demands of the public."

Long Bodied Truck on the Market

A new model in a two ton truck with a wheelbase of 191½ in. has been added to the regular line of the General Motors Truck Co. of Pontiac, Mich.

The new model was added by the company to meet the demand of lumbermen, furniture dealers and moving van operators for a truck which would cart a long body but at the same time not demanding an excessive weight.

Francis Fenwick Dead

A dispatch has been received as we go to press announcing the death of Francis Fenwick head of the firm of Fenwick Freres & Co., representatives in France of many of the well known American machine tool builders.

Mr. Fenwick has been in declining health during the past several months and the immediate cause of his death was heart failure.

Milwaukee Has Better Business Than Last Month

It already is certain that the volume of business booked by manufacturers of metalworking tools and machinery in the Milwaukee territory during September will represent a moderate increase over the August volume. There is nothing in the trend of business indicative of brisk activity but as a rule expressions heard in the trade contain nothing of pessimism. In some quarters no marked increase is expected until after Jan. 1, while the majority of makers and dealers as well look to see a moderate and steady improvement in sales from this time forward, as a continuation of the rising curve since midsummer dullness marked the low point.

The summary of Milwaukee industrial conditions prepared for its patrons by the largest bank of the city describes the situation as follows: "Reports of industry and trade in Milwaukee for the month of August were somewhat irregular. Significant variations, beyond those attributable to the season, have been lacking during the past Summer. Certain industries, particularly machine shops and foundries, have been affected by the prevailing hesitation in trade. Variation in the number of persons employed by the larger firms has held within narrow limits. In August, as in July, there was a slight net increase in employment, for which iron and steel and automotive and allied lines were chiefly responsible. The increase among large iron, steel and machinery firms was rather generally distributed."

The summary also says a considerable improvement in bookings of orders developed through August and the first half of September. This was most apparent in automobile parts and accessories, electrical goods, etc.

Makers of milling machines find that the demand for their products is at least as good as at any time in the past year, and express hopefulness that there are better things ahead for this branch of the machinery industry. The bulk of business has been with the automobile industry, which is again a more active market factor than for two to three months while the majority of interests were rearranging manufacturing specifications for their new season. No round lots have been sold in recent weeks, although it is understood several of the large producers are soon coming into the market for more than a few tools at a time. Ford, Chevrolet and Buick are most often mentioned.

Tool needs among manufacturers of electrical appliances and devices are gradually approaching a commanding position. The industry has been developing rapidly but hardly equal to the absorption of its output, and big things are looked for among manufacturers of shop equipment suited to the electrical goods.

Industrial construction is of small volume, and with a few exceptions manufacturing interests are doing little more than making small additions and rearranging present structures to secure whatever additional capacity their patronage requires for the present.

Steady Progress in Canada

There is every indication of continued improvement in the demand for machine shop equipment in Canada and prospects are good for Fall business in this line. In the principal industrial centers including Montreal, Toronto and Hamilton, metal workers continue to be well employed, and one manufacturer recently reported his sales for the last six months to be approximately $4,000,000 ahead of the same period last year with enough orders on the books to keep the plant running at capacity for several months.

Viewed in its entirety, industry throughout the country is holding steady, with improvement in many lines. The automobile trade has been well employed and the production of the cheaper lines of cars is at capacity. An Ontario automobile manufacturing firm of considerable magnitude had net sales for the first six months of this year of $21,141,777, as compared with a total for the same period in 1922 of $17,422,531, and the orders booked are today in condition to keep the plant running at capacity for several months.

The iron and steel industry has displayed a strong undertone of confidence in the future. The pig iron and steel markets have shown continued firmness. Foundries are receiving more orders and electrical manufacturing firms have been well employed.

Notable among the groups of industries which are maintaining high operating records or are increasing them are the pulp and paper industry and mining. In these two branches conditions have improved steadily. Much new capital has gone into both industries during the past year, for the establishment of new companies and expansion of those already operating.

During August, construction contracts awarded in Canada amounted to $27,488,700, compared with $25,187,500, a year ago. Business building amounted to $7,762,500, or 28.2 per cent, while industrial building totaled $1,778,500 or 6.5 per cent.

Quiet Week in Buffalo

The Buffalo machinery market at the present time seems to be reacting slightly to the somewhat encouraging activity earlier in the month and the latter part of August. It is fairer to say that the market is spotted. Some report that July was the dullest month of the year, that August was much better than July and that a bunch of orders came rolling in during the first half of September promising that the month would be far better than August.

On the other hand there are several who are decidedly pessimistic. One dealer claims that September is showing up worse than August and that he cannot see any big business ahead for the next three or four months.

A representative of a steel products firm selling cold rolled steel put the situation this way: "Business is normal, but disappointing because of the fact that a great many men in this line expected a whole lot more business this Fall than they seem to be getting or are likely to get. I can't say that the outlook is discouraging or alarming, it is just disappointing to those who looked for a record season."

Purchases of railroad machinery continue fairly good. One firm has had enough orders on its books, largely for railroad equipment, to run its plant through the slump of July without reducing personnel or lessening activity in any way. The same firm has enough orders ahead now so that the success of the season is assured. For instance, it is working on five or six carload orders of machinery for the South at the present time, mostly for agricultural implements and light machinery equipment.

Better Inquiries in Pittsburgh

Although there have not been any strong indications of an increased buying movement in the Pittsburgh district, the machine tool market is more encouraging in that a certain sentimental feeling is abroad that business is on the verge of a big uplift. Inquiries are far more numerous than they have been for several weeks, and those at the base of the inquiries are more in earnest than for some time that deals may be put through. As to the nature of these inquiries, they dwell mostly upon small tools or for small groups of tools, the only large list before the trade being that of the Pennsylvania R.R., which has been enlarged during the past two weeks. It is understood to be getting ready to buy for other points than in the immediate Pittsburgh district.

Used Machinery Active

While a number of plant machinery sales are reported in the past two weeks, it appears as if there is more activity in the used machinery market, specific instances being the sale of three 27x18-in. lathes to a Philadelphia user, a 36x29-in. lathe to a manufacturer in Canton, Ohio; a 42-in. boring mill and a 5-ft. radial drill to a concern in Iowa; a 100-lb. hammer to Minnesota; a pipe machine to a dealer in Youngstown, Ohio; a 5-ft. radial drill to a user at Greenville, Pa., and a 20-in. shaper to users just outside the city. Most of these sales were made by an interest that recently purchased several tools at the submarine base sale of equipment by the United States Navy at Boston, Mass. Sellers of used machinery in the district report that buyers are looking for good machines, and will make purchases here and there, if offered at reasonable rates. Among the awards recently was a 5-ton crane to a derrick builder. It is expected that formal announcement of crane awards by the Pittsburgh Plate Glass Co. will be made shortly, an Ohio builder being the successful bidder.

The Homestead Valve Manufacturing Co., of Homestead, Pa., manufacturer of quarter turn valves, has announced a merger with the Protected Seat Valve Co., of Pittsburgh. W. R. Schuchman is president of the first named company, which will manufacture a full line of check and angle valves.

Detroit Machine Tool Men Expect Busy Fall Season

Increased output from automotive plants in Detroit is continuing to have its influence upon the machine tool market here. Expansion prorams to care for greater production are being announced in some quarters and are being planned in others. An extraordinary number of changes in departments and manufacturing establishments indicate an extensive field for machine tools within the coming months.

One Detroit firm is preparing a formal announcement of two new machine tools which will be placed on the market soon.

Car loadings, which are hitting a higher figure each week, the inauguration of new train service, both freight and passenger, and the employment figures reflect a healthy condition.

During the week ending Sept. 18 members of the Employers' Association reported 215,830 employees, a decrease of 57 since the previous week when 215,887 were employed. The slight decrease is taken as evidence that the employment situation is becoming steady. A slight movement of Negro labor back South is noted with the approach of colder weather.

Attention during the past week has been focussed on the hearings held before the Interstate Commerce Commission Examiner and the Michigan Public Utilities Commission on the proposal of the Michigan Central Railroad to increase switching charges in Detroit. The Michigan Manufacturers' Association, the Detroit Board of Commerce, and the Milwaukee Junction Manufacturers' Association have united in opposing the increases which it is estimated will add more than a million dollars a year to Detroit's freight bill.

Executives in the machine tool industry look for a prosperous Fall and Winter. Comparisons show that Detroit has regained its normalcy, and there is every indication that business will remain stable.

Better Conditions in New England

Production in the New England territory is generally at a good rate and it is the opinion that business will steadily improve with the passing of the Summer months and the resumption of normal business. Interviews with twelve sales managers in this district brought forth statements of optimism in eleven cases and the general tone of the manufacturers was to the effect that a reasonable amount of improvement may be anticipated.

One Hartford machinery manufacturer has at present enough orders on hand to keep his factory busy for the next six months. Also this same manufacturer reports a sizeable amount of inquiries arriving each day and his prospects for expansion are considered very good. Railroads and glass makers are his two main purchasers.

There are other lines of industry also among the potential customers, but they are of lesser importance.

Many Sources Ready to Purchase

For turret machinery and mortisers made in New Britain, it is reported that the percentage of sales resulting from inquiries is running higher than is customary and that the demand is a trifle stronger than is usual at this time of the year. The automotive industry and manufacturers making electrical appliances are good customers of small and medium sized riveters, according to a Hartford manufacturer of these machines and the outlook for the Fall and Winter is most encouraging.

But one manufacturer in the Hartford-New Britain district reported that business was not up to better than usual conditions. He stated that he had just completed a trip through the New England states and had found buying curtailed and many dealers reducing their stocks on hand. However, he added that it was not probable that things would take on as bad an outlook as in 1921.

Generally, the New England district appears to be in a good condition with improvement anticipated in most sections. Railroads and the automotive industry are buying and hope is expressed that general industries and the textile trade will join the purchasing group before long.

Buying by Railroads in Chicago

The machinery trade in Chicago has not shown any material change during the past week. Some rather sizable railroad business is still in sight. The Burlington R.R. has not closed on its rather large list which has been outstanding several months but it is reported today that purchases will be made in the near future. The Elgin, Joliet & Eastern R.R. has placed orders for a 30-in. planer, an axle lathe, a car wheel lathe and a 44-in. boring mill. The Southern Ry. has asked bids on two large turret lathes. The Chicago & Northwestern R.R. is in the market for machine shop equipment, some small tools and a 20-ton crane for its shops at Madison, Wis. The Erie R.R. has placed an order for a 15-ton Hulett unloader. The Norfolk & Western R.R. has purchased a 20-ton locomotive crane. The Seaboard Air Line has placed an order for two 100-ton bushing presses. The Pennsy vania Ry. has purchased a 90-in. wheel quartering machine. The Central Railroad of N. J. has ordered a locomotive axle journal turning lathe and a car wheel borer.

A pig iron buying movement would quickly absorb present stocks and result in a shortage of iron, according to iron men in the Chicago district. For several months furnaces have been obliged to pile iron, and the general opinion has been that there is a surplus stock, but this is proved erroneous by a canvass made by a large selling agency recently. The canvass shows that if all the furnaces in the country had been obliged to suspend operations the surplus stocks on hand would not have run the country twelve days. This, the report says, is a narrow and perilous margin.

During the last two or three weeks production of steel has dropped four points to around 76 or 77 per cent, and there is a possibility that even lower figures will be reached within the next few weeks. However, most of the larger producers have sufficient business on their books to insure fairly heavy operating schedules for several months at least.

New York's Future Encouraging

There was no improvement in the New York market this week, according to dealers, but there was also no backward step, making the score even with always a chance of improvement within the near future. Expressions of hope for the very near future were expressed by most of the sellers interviewed and every confidence was expressed for the Fall and Winter seasons.

That the trade is at the present marking time is not surprising. Many sales have been completed within the past month—a larger number than is expected for the August-September period—and this is the lull that follows upon the flurry of buying.

Railroads have been practically the only buyers in the New York district during the week with the exception of the Western Electric Co. that made rather extensive purchases for its Kearney, N. J. plant.

But the future holds out every reason for improvement. The automotive industry is resuming full time operation and inquiries are out from many of the shops for machine tools. Makers of electrical equipment are getting ready to enter the market, it is rumored, and large orders are expected to be the result. General industries are working at a higher percentage of capacity than was expected and expansions seem inevitable in many lines.

Used machinery dealers report improvement during the past week but are still dissatisfied with conditions.

Improvement Noted in St. Louis

There has been some increase in the number of inquiries received by machine tool manufacturers at St. Louis but beyond that very little improvement has been noted in the market. Many shops are still working on part time schedule and are having no difficulty in keeping abreast of their orders.

The railroads are buying only what they need, as are other lines of industry. There is no expansion in the equipments of machine tool users. All buying is for present demands only.

One lathe builder shipped two or three lathes to the Southwest last week and said that things were looking up a bit as to inquiries, but that orders actually closed were scarce.

The Medart Mfg. Co., maker of overhead power transmission machinery, reports that its business is fair and that it has an inquiry pending for a large order.

The labor situation generally is better

here and in the machine shop industry in particular there is no complaint as to the number of mechanics available and no difficulty over scales of wages is being encountered.

Collections are reported as somewhat better. One firm stated that collections were good with it and attributed the condition to the fact that it has aggressive collectors.

The automotive industry is still active and various factories buy what they need in the machine tool line, but of course these needs are limited.

Woodworking machinery is moving at a fair rate.

Personals

JAMES W. HOOK, for the past six years president of the Allied Machinery Co. of America, has resigned that position to enter the manufacturing field, and on Oct. 1 will become associated with the Geometric Tool Co. of New Haven, Conn., as vice-president and general manager.

GEORGE R. WOODS, manager for R. S. Stokvis & Sons. Whitehall Building, New York City, has returned from a vacation spent in the Megantic Preserve, Maine.

WILLIAM W. PEACOCK is now associated with J. L. MCCARTNEY in the Pittsburgh office of the Niles-Bement-Pond Co., New York. He was formerly with the Pittsburg office of the Motch & Merryweater Machinery Co., Cleveland.

M. S. PALMER will represent the brass goods companies of Manning, Maxwell & Moore, Inc., in the New England district. His office will be at 5 Watson St., Boston.

E. C. REBESKE, who recently was elected president of the Standard Gage Steel Co., Beaver Falls, Pa., is also secretary and treasurer of the Union Drawn Steel Co., of the same place.

F. A. CROSELMIRE of Newark and New York City, has been appointed vice-chairman of the contest board of the American Automobile Association, according to an announcement made by Joseph Mack of Detroit, chairman of the board. Mr. Croselmire will have supervision of the New York office of the board.

JOHN ROLLINS, representative of William Marples & Sons, Ltd., tool makers, Hibernia Works, Sheffield, England, is now in Montreal, Canada, and is calling on the trade in the interests of his firm.

OTTO M. RAU of Philadelphia, and DR. FREDERICK H. NEWELL of Bradford, Pa., have been appointed consulting engineers on the Pennsylvania Giant Power Survey, authorized by the Legislature to study natural resource conservation. Mr. Rau is a power specialist and formerly was connected with the Edison General Electric Co. of New York. Dr. Newell has a long record of engineering service. He has written extensively on scientific subjects.

E. C. RICKS, of Pittsburgh, a coke oven machinery manufacturer, has purchased the Evans Mold & Foundry Co., of Uniontown, Pa., and hereafter will specialize in the manufacture of parts for mining machinery.

EDGAR BLOXHAM, Paris representative of Sleeper & Hartley, Inc., 335 Chandler St., Worcester, Mass., is visiting in the United States and is also on a purchasing trip for Paris manufacturers. He states that the future looks encouraging in France.

Business Items

The H. P. Townsend Manufacturing Co., Hartford, Conn., will occupy its new building in the course of two weeks. It adds 4,500 sq.ft. of floor space.

The American High Speed Chain Co., 225 E. South St., Indianapolis, Ind., has moved into its new plant which gives it nearly double capacity.

New machinery is being installed in the National Spring & Wire Co.'s factory at Albion, Mich. The company expects to begin operations shortly.

National Cast Iron Pipe Co., of Birmingham, Ala., has opened an office in the A. G. Bartlett Building, Los Angeles, Calif.

The Waterhouse & Lester Co., 534-548 Howard St., San Francisco, Calif., operating on the Pacific coast since 1851, in the vehicle and automotive equipment business, has entered the machine tool field. The company has taken over several of the lines carried in the Pacific coast territory by Eccles & Smith, who have discontinued operations in that field.

The Bethlehem Steel Co. has ordered from the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., electrical equipment to replace a steam drive for a 30x48 in. Universal plate mill in its Lackawanna plant, located near Buffalo, N. Y. The value of the order is about a quarter of a million dollars.

Federal incorporation has been granted in Canada to the Western Steel Products, Ltd., with headquarters in Winnipeg. The capitalization is fixed at $2,000,000. The president of the company is H. Ormond, and the vice-president and general manager, H. C. McMartin whose place of residence is 1167 Grosvenor Ave., Winnipeg.

The Oakland motor car factory at Pontiac, Mich., expects to increase its capacity to 500 cars per day when the $2,000,000 alterations now well under way are completed.

Construction has been started on the new home of the Detroit Auto Specialties Co., one of the Hupp Motor Car Corp.'s subsidiaries, which will more than double the company's manufacturing area. The new building, which is to be 504 x 120 ft., is being erected at Mt. Elliott Ave. and Dunn Road, in the rear of Hupp's main plant. Completion is scheduled for about the first of the year, following which the present location of the Hupp subsidiary at Hamilton and Milwaukee Aves. will be abandoned, it having recently been sold.

The Jones & Laughlin Steel Corp., of Pittsburgh, Pa., is tabulating bids for 12 or 15 crane installations, including those for a new bar mill.

Many New Freight Cars in Use

The railroads of the United States during the month of August placed in service 19,167 new freight cars, as well as 362 new locomotives. They also had on order on Sept. 1, with deliveries being made daily, 72,906 new freight cars and 1,517 new locomotives.

During the month of August, the railroads placed in service 7,478 new coal cars which brought the total number placed in service from Jan. 1 this year to Sept. 1 to 46,659. They also placed in service during the month of August, 6,726 new box cars. From Jan. 1 to Sept. 1 new box cars placed in service totaled 46,154.

The railroads in August also placed in service 3,743 new refrigerator cars and 478 new stock cars.

Of the new freight cars on order on Sept. 1, box cars numbered 31,807; coal cars 29,203; refrigerator cars 6,989 and stock cars 3,079.

New locomotives installed during the first eight months this year totaled 2,583.

Will Discuss Coal Problems

America's coal problem will be brought before the engineers of the nation at Rochester, N. Y., Oct. 12 and 13, when, it is announced by President Mortimer E. Cooley, the executive board of the American Engineering Council of the Federated American Engineering Societies will convene for a discussion of industrial and scientific questions.

Of chief interest will be a report of the Federation's Committee on Coal Storage, which has been conducting a study in co-operation with 107 local committees all over the country. Characterizing the investigation, a statement by the Federation declared that the engineers "are not viewing the storage of coal as a practice which should be adopted on any basis other than that of sound economic judgment."

Less Freight in Holiday Week

Loading of revenue freight for the week which ended on Sept. 8 totaled 928,858 cars. This was an increase of 105,611 cars over the corresponding week last year, and an increase of 179,306 cars over the corresponding week in 1921.

Due to the observance of Labor Day, and also the suspension of operations in the anthracite coal region, the total for the week of Sept. 8 was a decrease of 163,709 cars under the week before, when loadings totaled 1,092,567 cars, the greatest for any one week in history.

Loading of merchandise and miscellaneous freight, which includes manufactured products, totaled 541,371 cars. This was a decrease of 80,839 cars compared with the week before, but was an increase of 48,413 cars over the corresponding week in 1922, and an increase of 88,178 cars over the same week in 1921.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

(Copyrighted, Theodore H. Price Publishing Corporation, 16 Exchange Place, New York)

WHEN in Chicago last Tuesday and Wednesday every business man that I met asked the same question. They wanted to know "What is the matter with Wall Street?"

They were all busy and optimistic, but having been taught that the action of the stock market anticipated the advent of good times or the reverse they were at a loss to understand its persistent lethargy at present.

That the tone of the New York Stock Exchange has a profound influence upon the minds of business men in this country is to be admitted. Those who operate there are mistakenly supposed to be super-sagacious if not clairvoyant. The business done there is the subject of lengthy reviews that are published in every important city along with the quotations of all the more active securities, and though they may not be speculators it is as impossible as it would be unwise for merchants and manufacturers to ignore an influence so noticeable.

For this reason I think the most substantial service that I can render to the readers of this letter is to point out why the stock market is no longer to be relied upon as a barometer whose rise or fall indicates the approach of storm or fair weather in the commercial world. When it first came to be so regarded it was the place in which most of the uninvested capital of the country found employment either in loans on Stock Exchange collateral or in the purchase of Stock Exchange securities.

Now there are many other ways in which the capitalist can use his money profitably and there are a score of cities where the local investment market is almost as important as was that of New York in the not distant past. With the aid of the underwriting machinery that has been so perfected in recent years hundreds of millions of new securities are distributed each month among multitudes of investors all over the country.

In this work thousands of banks are enlisted. The securities are offered to those who have credit balances with these banks. They do not have to resort to the Stock Exchange to invest their money and most of the stocks and bonds thus put away stay put. The Liberty Bond campaigns opened the eyes of bankers to the buying power of the small investor and it has been intensively cultivated.

Marginal speculation has been discouraged and disparaged, while investment has been encouraged by every legitimate device. Thrift is preached, the alchemy of compound interest is advertised and the bucketshops that have recently welched are held up as examples of what one may expect from any stock broker.

As to the larger capitalists—the very rich men whose operations used to make or unmake values on the Stock Exchange—the income tax has destroyed their initiative. One of the richest men in the country, who is known to have been a very bold speculator, has just announced his retirement. He says that because the government takes half his profits and leaves him to pay all his losses there is no inducement to assume the risks involved and he has quit.

This is the view of many wealthy men who used to trade largely in stocks. They have retired and put their money in tax exempt securities.

> "These conditions are reflected in a record freight tonnage, with railroad earnings to correspond and bank clearings that are equally satisfactory . . . . Facing these facts, continued prosperity would seem to be indicated with the probability of great activity as France, Germany and Great Britain progress in the formation of the economic and industrial entente toward which they appear to be moving."

And finally there are the Federal Reserve Banks. In the old days the New York banks carried a preponderant share of the nation's bank reserves. To be safe they had to keep large cash reserves and secondary reserves that were still larger. These secondary reserves were chiefly loaned on Stock Exchange collateral, supposed to be instantly convertible. It was practically the only way in which a secondary reserve could be invested. An enormous fund was thus placed at the disposal of the stock market.

Now this is all changed. The banks keep but little cash on hand. Their reserves are their balances with the Federal Reserve Bank, where they can rediscount their commercial paper in an emergency. Secondary reserves are no longer necessary and Stock Exchange loans are not sought as previously because they cannot be rediscounted.

As a consequence the Stock Exchange speculator has to pay more for his money and he is correspondingly handicapped and discouraged. These changes are for the most part desirable, but they explain why the stock market has ceased to be a barometer of the nation's business and why its tone may be safely disregarded if it is not in harmony with the many other more important factors that make up the economic complex.

These remarks are prompted by the weakness of the oil stocks last week. Those among whom they were distributed under cover of the stock dividends declared last year have been selling them because the large production of oil is supposed to have made the business of refining petroleum and distributing its products unprofitable.

Logic suggests the reverse and the *denouement* will probably prove that logic is right, but the speculator whose margin is running out can not be logical, and the losses of those who had been persuaded to buy "the oils" has weakened the whole stock market.

But the movement is not significant otherwise, and with all the other indicia of business pointing to fair weather it seems unreasonable to expect rain because a section of the stock market is beclouded.

The Federal Reserve statement shows a gain of $11,000,000 in gold holdings and a rise of 1.3 per cent in the reserve ratio which now stands at 77.2. Trade continues active in almost every quarter.

For reasons peculiar to each of them, cotton, sugar, and coffee are all strong and higher. Even copper and leather, the two laggards among the commodities, are looking up. Wheat is recovering from the blow dealt it by the discovery of the Canadian surplus. A further increase in building activity is reported.

These conditions are reflected in a record freight tonnage, with railroad earnings to correspond and bank clearings that are equally satisfactory.

Facing this array of facts continued prosperity would seem to be indicated with the probability of great activity as France, Germany and Great Britain progress in the formation of the economic and industrial entente toward which they appear to be now moving under the duress of the national debts with which they are burdened.

Increased Surplus of Freight Cars

The railroads on Sept. 7 had 67,651 surplus freight cars in good repair and immediately available for service if necessary according to reports filed by the carriers with the Car Service Division of the American Railway Association.

This was an increase of 1,092 cars compared with the number of surplus freight cars on Aug. 31.

On Sept. 7 the car shortage amounted to 10,211 cars, an increase of 770 cars since Aug. 31.

Of the total number of surplus freight cars, 13,501 were coal cars, an increase, due to the suspension of anthracite mining, of 9,579 cars within approximately a week. Surplus box cars totaled 45,245.

Progress Recorded by Machine Tool Exhibit

Well attended exhibit at Mason Laboratory, Yale University—The passing of many familiar machine tools and factory accessories—Exhibit to be yearly event

THE third annual Machine Tool Exhibit, held at the Mason Laboratory of Yale University Sept. 18 to 21 inclusive, reflected the growing enthusiasm of the machine and tool builders of New England for an annual display that shall be representative of that industry and section. The exhibition was even more diversified and comprehensive than last year. By unanimous vote, it was decided to make the exhibit an annual affair.

Unlike many exhibitions of machinery, this one is confined almost wholly to machines and tools that are used for the purpose of constructing other machinery capable of turning out duplicate parts that formerly required hours to complete in less than the same number of minutes.

A feature of the industry brought out by the display is the tendency toward the design of special purpose machines adapted to finish in one single continuous operation machine parts that have hitherto required the services of several machines and which must pass through many individual operations, all dependent more or less upon the skill that the operative could bring to his work.

The absence of countershafts and other overhead construction was also noticeable, nearly every machine shown having its individual driving motor attached to and often hidden within the base. The advantage of this condition can best be appreciated by one who is familiar with the maze of belts and pulleys that only a few years ago constituted a necessary auxiliary of the average machinery building plant.

Compact Designs

Many of the larger machines exhibited displayed the tendency toward compactness of design and unit construction. A machine that formerly would have required hours or even days to erect and put in running condition can now be swung into place suspended from a single eye bolt from the overhead crane and may be in full operation within ten minutes from the time of depositing it on the floor.

Unit construction permits any important group of parts to be removed for repairs or adjustment by merely withdrawing the holding bolts instead of the entire dismantling of the machine.

Precision and production seem to be the keynotes of modern machine tool building. Even the toolroom lathe and milling machine, though retaining all the versatility of their immediate predecessors and possessing many additional features besides, are now made of such massive proportions as to be capable of aborbing more power to an individual unit than formerly served to drive a whole machine shop and without in any way lessening the accuracy of their product.

The geared head and constant speed drive have practically supplanted the familiar cone on all the larger machines and in many cases where the driving belt is retained it is enclosed. On none but the smaller tools was the old cone and belt in evidence.

The rapidity of the use of the machine tool industry as a whole was well brought out by informal talks in the lecture room of the laboratory showing the achievements of the pioneers and tracing the line of descent from them to the prominent machine tool manufacturers of the present day. The speakers were Joseph W. Roe, Professor of Industrial Engineering at New York University, and Guy Hubbard of the National Acme Co. of Windsor, Vermont. Mr. Hubbard himself is a direct descendant of one of these pioneers.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0337	$0.0337	$0.0285
Cold finished shafting	per lb.	0.0433	0.0428	0.0373
Brass rods	per lb.	0.17	0.1741	0.1666
Solder (½ and ½)	per lb.	0.276	0.276	0.2283
Cotton waste	per lb.	0.1225	0.1231	0.1458
Washers, cast iron (½ in.)	per 100 lb.	4.66	4.66	4.00
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.08	3.08	2.96
Lard cutting oil	per gal.	0.575	0.575	0.575
Machine oil	per gal.	0.349	0.349	0.36
Belting, leather, medium	off list	37%	37%	44½%
Machine bolts up to 1x30 in.	off list	49½%	44¼%	53½%

Old Time Machine Shown

To illustrate the fact that modern production machinery has been developed almost within the memory of a single generation, there was shown upon the screen a picture of the first automatic—commonly misnamed the "automatic screw-machine"—ever built. It was designed by the late Christopher M. Spencer. In active charge of one of the exhibits on the floor was found a man who actually assisted Mr. Spencer in its construction.

What is believed to be the first milling machine ever constructed, built in 1810 by Eli Whitney, was shown in the lecture room—not a picture but the actual machine. The first of the "Lincoln type" milling machines, a Windsor, Vt., product, was also shown.

An innovation was introduced on Thursday evening in the shape of an actual demonstration on the floor of the lecture room of several of the machines selected for the purpose from among the exhibitors. The power driven helve hammer of the High Speed Hammer Co., the "Triplex" combination bench lathe, milling and drilling machine, the Bullard "Contin-U-Matic," and the new Hendey 14-in. tool room lathe were chosen.

Mr. Moore, engineer of the High Speed Hammer Co., gave an informal talk on the problems of riveting as encountered by machinery manufacturers and demonstrated the applicability of his hammers to the riveting of anything that could be riveted by hand. He brought out the fact that such diverse materials as comparatively hard steel and fiber were successfully riveted and that the machine was also regularly applied to the cutting of glass.

The Triplex machine was capably demonstrated by John Cetrule, sales agent of the Triplex Machine Tool Co., who put the machine through its paces and showed its adaptability to a very wide range of small machine and tool work.

Constant Bullion, engineer for the Hendey Machine Tool Co., described the applicability of the Hendey 14-in. tool-room lathe to many odd and peculiar jobs that would ordinarily require a milling machine, as well as its versatility on the ordinary run of regulation lathe work.

Because of the weight of the Bullard Contin-U-Matic—it weighs 12 tons without the tools—Mr. Blanchard, the demonstrator, was obliged to apologize for not bringing the machine into the lecture room with him, and had to resort to the projecting lantern and screen to show its construction and operation. Despite his handicap, he was able to give his audience a very comprehensive idea of its capabilities.

Floors Crowded

Interest in the exhibition as a whole was amply evidenced by the crowds of spectators that thronged the floors during the afternoons and evenings. Not a few of the machines shown were in actual production, work having been brought in from the factories where the machines were in regular operation before the exhibition was opened and to whence they were returned after it was closed.

Two resolutions were passed by the exhibitors. One was to Yale University expressing appreciation of the interest shown by that institution in its contributions to the exhibit and the use of the Mason Laboratory and the other was to William Smith Mason and George Grant Mason, the donors of the laboratory to Yale University. C. F. Oswald of the Standard Safety Manufacturing Co., New Haven, Conn., was the chairman of the Resolution Committee for the Exhibitors.

What's Going to Happen to Germany?

With the mark defunct and labor clamoring for more pay, industry is handicapped almost beyond the powers of recovery—The import and export question

By OUR BERLIN CORRESPONDENT

GERMANY has passed through a series of internal convulsions, which have shaken her economic structure down to the ground work. Every business man in the country was well aware that the stabilization of the mark would evoke quite an economic revolution. That almost the identical effect expected from this event would be produced by hypertrophical inflation has been anticipated by no one. Outwardly the upheaval has found expression in labor unrest. Strikes and acts of violence in factories which, although much more serious and numerous than the public was led to believe, was mostly confined to threats. Inwardly, however, a most radical and rapid change has prepared itself, completely altering all existing relations in the cost and price problem. The evolution toward the gold standard pent up so long, as outlined in these columns (*American Machinist*, Vol. 59, No. 6, page 234h), which under a certain continuity of conditions would have taken many months to develop fully, has enacted itself with amazing swiftness, almost with the force of an explosion, thereby widely overrunning all carefully mapped out confinements. The whole edifice of inflation has come down with a crash.

Through the dust stirred up thereby it can already be recognized that the German industry emerges from the jumble in an entirely new situation. The privileged position it has occupied up to now in the matter of cost has clearly become history. Henceforth it will have to take its stand alongside of its foreign rivals, competing with them on level ground. How this happened may here be briefly chronicled as the most momentous development in Germany's eventful post-war experiences.

The Turbulent Currency

The chief organic causes were the breath-taking mark depreciation and the insufficient appropriation of foreign funds to the import trade which seriously impaired importation. A considerable dearth resulted, closely followed by a gigantic tidal wave of prices which in the case of all necessities of life created a situation affording an excellent playground for all latent destructive forces. The finishing touch was supplied by comparatively so insignificant a matter as the temporary shortage of banknotes. While this happened, the problem of stabilized wages was still on its march yet requiring a good deal of delicate handling before it could be brought into a secure harbor. The inevitable result was that it got out of control and broke bounds, while employers and employer's representatives were still haggling over matters of detail. All the good intentions on both sides to settle the problem in a fair spirit taking due regard of the difficulties resulting to the industry have been swept away by the onrush of unloosened elementary forces. The functionaries of the unions and the industrialists, both badly frightened, beat a hurried retreat falling back upon the line of least resistance which could be nothing else than full accession to the workmen's demands. It was clearly beyond the union's power to help the industry establish wage rates, keeping at a certain ratio below the pre-war level as they had promised to do. Cost of living which the unions have insisted upon as a standard of adjustment having surpassed the pre-war level, matters have automatically been carried beyond. The apprehensions of the industry in this respect have indeed been realized quickly.

Wages and the Cost of Living

Cost of living being a direct function of wages, the spectacle of a rapid reciprocating movement between the two is afforded. Instead of the mad chase between the mark rate and prices, prices and wages have engaged in a simultaneous spurt with the mark rate merely standing by, fairly at rest. Peculiarly enough publicly controlled prices like those of coal, iron, transportation and communication in general, can now be discerned as the prime movers. The policy of keeping these basic prices at an artificially low level, preserved for so long as a boon to the German industry has evidently been given up.

> "In industrial circles it is declared that the German industry cannot compete on foreign markets at a pre-war rate of wages, not to speak of a higher one. In the Berlin machine tool industry the opinion was heard that the highest rates this industry could afford to pay are 75 per cent of the pre-war equivalent which opinion seems to be shared by manufacturers in general."

A striking illustration is afforded in the matter of coal prices. The price of the lowest grade of Ruhr coal has been fixed at a level, which at the date of adjustment corresponded with an amount of 59 gold marks per metric ton. In 1914 this price was from 12 to 12.40 marks. The present price contains an allowance of 33⅓ per cent to the mines as advance compensation of any losses they might sustain by money depreciation during the time intervening between the delivery and the receipt of payment. On top of that a further 30 per cent of the total is added by way of a coal tax. The former percentage amounts to 11.40 gold marks and the coal tax to 13.60 gold marks, which alone is more than what this grade of coal cost in 1914. The present price of coal which is now understood to be stabilized in its relation to wages and other cost influencing factors is 390 per cent higher than the pre-war price. The times of cheap German coal are evidently past. It has within a few weeks climbed to the top of the price scale of all coal producing countries.

Less strongly pronounced is the change with regard to iron and steel prices that have been adjusted at a level approximately 60 per cent above the pre-war level. This, however, happened when coal prices were still in the beginning of their precipitate movement. The ratio to pre-war parity that iron prices will eventually assume is presumably much higher. Cost of freightage has some time ago surpassed the pre-war level. This condition is perpetuated by the new system, of keying it to the gold standard. In this instance also the new level of coal prices has not found time to take effect. As coal constitutes about 40 per cent of operating expenses, the railroads have to further increase the basic rates of freightage since the administration is now determined to cut out its enormous deficit. The leaks provided by the system of granting respites for the payment of freightage, amounting in times of mark depreciation to a considerable discount will be stopped at the same time.

Taking into account the price level of coal, iron and freightage as the basis of general price adjustment of manufactured goods present conditions seem to point to a future level at least 100 per cent above the pre-war average. How much of this growth is of permanent nature and how much of it is due to the general heedless rush and capable of receding will be seen by future experience. This will be determined by the ratio to pre-war parity at which wages will ultimately settle. The categories of labor leading in the wages dispute for the reason of their strongest position are the printers and miners.

In industrial circles it is declared that the German industry cannot compete on foreign markets at a pre-war rate of wages, not to speak of a higher one. In the Berlin machine tool industry the opinion was heard, that the highest rates this industry could afford to pay are 75 per cent of the pre-war equivalent which opinion seems to be shared by manufacturers in general. Strong efforts are at work openly and behind the curtains to screw wages back to this level. The manufacturers' organizations have strongly prevailed on their members to come to the rescue of the state finances with all gold funds available on the understanding that food stuff should be imported on a large scale for the purpose of lowering prices and incidentally the index of living cost. Since the latter has been adopted as the standard of wage stabilization it seemed to be the obvious thing to take up the manipulation of wages from this angle.

Trade Unions Back Manufacturers

In such efforts the manufacturers are secretly backed by the trade unions. The latter have chiefly the unemployment question at heart in which respect their interest naturally coincides with that of the manufacturers. The country has to export or it cannot pay its imports in which case the lines of industry dependent on imported raw material must suffer. This is only one side of the business aspect. The de-

pression resulting from a serious contraction of the export business must, in view of the greatly impaired domestic purchasing power, be considered quite general.

This is shown by the experiences of last Spring when the industry was faced by similar conditions which then were produced by a rather sudden improvement of the mark rate with serious consequences to business. Had it not been for the fact that manufacturers continued to sell at unchanged export prices which then were ruinous, in the expectation of a further downslide of the mark, the effects to business would doubtless have been pronounced still more sharply. Conditions now are quite different. A further aggravation of the mark rate will not help since wages will follow immediately. That such effects in the present case are not overrated is evidenced by reports from all parts of the country, almost signalling a collapse of business.

From the general confusion of opinions it is apparent that the German manufacturers cannot at pre-war wages produce and sell at pre-war prices and that the relation between the two has materially changed. This could be observed in all cases where the sales price has been put on a gold mark basis, thereby making its relation to the pre-war standard more evident than the paper mark price permits. In the case of measuring tools and small tools, this gold price approximates the pre-war price at a rate of wages of about one-half of the pre-war average. It is generally accepted more or less as a fact that if given equal wages, the sales price must be now at least twice the pre-war price.

Still there is no doubt that costs are generally enhanced in comparison to pre-war times. This is usually ascribed by manufacturers to lower efficiency of labor, the large amount of unproductive labor manufacturers have to carry and to the fetters of official control, requiring a good deal of wasteful "red tape." As regards efficiency of labor, opinions of manufacturers are divergent. While some speak of a 50 per cent efficiency others declare that pre-war efficiency has been reached. In the other two respects they quite concur. It is a fact that the volume of production per head has dropped to about one-half. Whether the excessive number of employed is pre-eminently due to the new labor legislation or also to conditions still under the control of management is more or less irrelevant. The question must be how to dispose of the number of employed, dispensible under the rules of strictest economy, called by the late Rathenau the "invisible army of unemployed." The German industry has not been able to rid itself of it during periods of exceptional prosperity. How to do it in times of heavy depression with an ever increasing visible army of unemployed is the great and most serious problem of the future.

Trade Catalogs

Adjustable Speed Motors. The Reliance Electric & Engineering Co., Cleveland, Ohio. The Reliance type AS adjustable speed motor is described in detail and illustrations show the motor and its parts. Tables of ratings are also contained in the booklet.

Rolling Mill Machinery. Mesta Machine Co., Pittsburgh, Pa. A well bound booklet, mostly illustrations, showing the plant and the product of this company, has recently been issued. The booklet is unusual and shows exceptional views of its mammoth machinery.

Electric Conduction Heaters. The Cutler-Hammer Manufacturing Co., Milwaukee, Wis. Various machines with this product as a part of them are shown in an eight-page folder. Descriptive matter, cuts and tables are used as means of illustration.

Thermit Rail Welding. The Metal & Thermit Corp., Equitable Building, New York City. The new pamphlet issued brings up to date the whole subject of thermit rail welding to cover the many recent improvements in economy and efficiency. The pamphlet includes detailed instructions, accompanied by illustrations and drawings, showing steps in making the improved thermit rail weld which has greatly reduced the cost per joint. Improved apparatus used in connection with thermit rail welding, such as the self-luting mold box and the new lightweight double-burner preheater which have greatly accelerated the speed of operation, is described in detail for the first time, as well as illustrations showing results of a ten years' service test of the thermit rail weld, also rail bending and drop tests. Instructions for using thermit for welding compromise joints, constructing frogs and crossings and repairing loose arms of switches have also been included in complete form. At the end of the pamphlet is a discussion of the theory of rail joints.

Combination Automatic Piston and Piston Ring Machine. Potter & Johnson Machine Co., Pawtucket, R. I. There is a general description of the 2-P combination automatic piston and piston ring machine contained in this booklet of sixteen pages. Diagrams and half-tone illustrations are also contained therein.

Dial Indicators and Gages. Frank E. Randall, Waltham, Mass. Two pamphlets describing these two products are being sent to the trade. Illustrations and descriptions are contained therein.

Sprue Cutters. The Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill. A circular with a picture of the Milwaukee sprue cutter, its specifications and details of the machine has been mailed out by this company.

Open Ratchet Braces. The Consolidated Tool Works, Inc., 296 Broadway, New York City. Various styles of ratchet bit braces with weights and measurements of each have been described in recent circulars.

Reamers, Chucks, Collets, Turret Lathes and Attachments. McCrosky Tool Corp., Meadville, Pa. A catalog of this corporation's products with specifications, illustrations, charts and descriptions has been issued.

Industrial Trucks and Tractors. Crescent Truck Co., Lebanon, Pa. The economy and efficiency of electric industrial trucks and tractors in warehouses and manufacturing plants are pointed out by this catalog. There are many convincing illustrations contained in the booklet and fac-similes of letters received from users.

Portable Electric Tools. The Hisey-Wolf Machine Co., Cincinnati, Ohio. Hand drills, motor drills, grinders, reamers, buffing lathes, and other types of portable tools electrically operated are illustrated and described in this catalog. Specifications and information regarding the tools are also given.

Slight Decrease Shown in Living Cost

The cost of living in the United States on Aug. 15, 1923 was 61.6 per cent higher than in July, 1914, according to figures just collected by the National Industrial Conference Board. Between July 15 and Aug. 15, 1923, there was a decrease of three-tenths of one point or two-tenths of one per cent. Between July, 1920, when the peak of the rise in the cost of living since 1914 was reached, and August, 1923, the cost of living dropped 42.9 points or 21 per cent.

Pamphlets Received

Some Compressive Tests of Hollow-Tile Walls. Technologic Paper No. 238. Department of Commerce, Bureau of Standards, Washington D. C. Price, five cents. The various tests that were recently made by Herbert L. Whittemore, mechanical engineer, and Bernard D. Hathcock, laboratory assistant of the Bureau of Standards are embodied in this pamphlet.

The Service of Organized Industry. By Julius H. Barnes, U. S. Chamber of Commerce, Washington, D. C. An address delivered by Mr. Barnes who is the president of the United States Chamber of Commerce, at the annual meeting of the National Association of Insurance Agents, held in Buffalo, Aug. 22.

Proceedings of the Ninth Annual Meeting of the International Association of Industrial Accident Boards of Commissions. U. S. Department of Labor, Bureau of Labor Statistics, Washington, D. C. The official copy of all of the proceedings of the meeting which was held Oct. 9 to 13, 1922, are contained in this pamphlet.

Intermediate Training for High School Graduates. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. The curriculum and an outline of the studies that are taken up are explained in this pamphlet. It is illustrated with pictures of graduating classes and class rooms with students engaged in different pursuits.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Small stationary motors, two to twelve hp. Papendrecht, Netherlands. Purchase and agency. Reference No. 7761.

Automobile accessories. Berne, Switzerland. Agency. Reference No. 7752.

High tension magnetos. 1,000 carburetors, engine parts and general motor accessories. Sydney, Australia. Purchase. Reference No. 7753.

Kerosene oil engines. Dublin, Ireland. Purchase and agency. Reference No. 7686.

Woodworking machinery. Hongkong, China. Purchase. Reference No. 7702.

Forthcoming Meetings

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary, Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

National Safety Council. Twelfth annual congress at Buffalo, N. Y., Oct. 1 to 5. All meetings will be held at the Statler Hotel. Headquarters, 168 No. Michigan Ave., Chicago, Ill.

American Society for Steel Treating. Annual convention at Pittsburgh in connection with the International Steel Exposition, Oct. 8, 9, 10, 11 and 12. W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio, national secretary.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Gear Manufacturers Association. Fall meeting. Mountain House, Lake Mohonk, N. Y. Oct. 25, 26 and 27. T. W. Owen, secretary, 2,443 Prospect Ave., Cleveland, Ohio.

American Management Association. October 29, 30, and 31, Hotel Astor, New York City.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

New and Enlarged Shops

Machine Tools Wanted

Colo., Colorado Springs—W. L. Tomkin, 11 Red Rock Ave.—drill press, lathe and emery stand for garage at Picher, Okla.

Fla., De Land—J. E. Fearington & Son (garage)—lathe, drill press, bench tools and oven to bake enamel.

Ky., Maysville—Wold Mfg. Co.—drill press, lathe, etc., for the manufacture of motorcycles.

Md., Cumberland—F. C. Dreyer, 23½ North Mechanic St.—engine turning lathe with tools, chucks and countershaft, 18 in. swing, 9 ft. 6 in. between centers (used).

Mass., Boston—McCulloch Mfg. Co., 216 High St. (machinists)—heavy duty lathe, planer, shaper, bull-dozer, drill press and miscellaneous machine tools to enlarge shop.

Mass., Cambridge—Dixon & Fallis, 3 Dock St. (pattern makers)—screw cutting lathe with compound rest, 26 in. swing, 12 ft. bed (used).

Mass., Waltham—J. L. Thomson Mfg. Co., South St. (manufacturer of riveting machines and hammers)—large and small metal working tools, including lathes, planers, shapers, bull-dozer, drills, reamers, etc., for proposed machine shop.

Mich., Detroit—Detroit Torch & Mfg. Co., 12141 Cardoni Ave.—general machine shop equipment to enlarge plant for the manufacture of brass goods.

Mo., Joplin—City Garage, 2nd and Joplin Sts., A. C. Cox, 2402 Picher St., Purch. Agt.—tool post grinder.

Mo., St. Louis—L. Inserra, 813 North 8th St.—lathes, emery wheel, etc., for garage and repair shop.

N. Y., Bath—H. Ford, West Steuben and Howell Sts.—equipment for garage and repair shop, to replace that which was recently destroyed by fire.

N. Y., Buffalo—J. Battaglia, 325 Connecticut St.—garage and repair shop equipment.

N. Y., Buffalo—P. A. Dunn, 647 East Ferry St.—equipment for proposed small factory for the manufacture of Ford units and small machine parts.

N. Y., Buffalo—W. Sperling, 589 Linwood Ave.—equipment for garage and repair shop at 1689 Main St.

N. Y., Clifton Springs — Sommers-Farnsworth Motors, Inc., D. F. Sommers, Purch. Agt.—equipment for garage (new).

N. C., Littleton—Wollett & Son (lumber)—pulleys, hangers, portable key seating machine, one 60 or 70 in. shavings fan, cyclone dust collector, complete dry kiln outfit, filling room equipment for 7 in. bandsaws, side grinder and iron lathe, about 16 in. swing, 10 ft. bed.

O., Amherst—Cleveland Stone Co.—one 14 in. and one 16 in. lathe, drilling machine, slotting machine, shaper, milling machine and 4 ft. radial drill.

Okla., Oklahoma City—Beeman Co. (machine shop)—12 to 16 in. lathe, quick change gears.

Okla., Picher—Amer. Machine Wks., F. Scott, Purch. Agt.—lathe.

Okla., Picher—Rabb & Powell Supply (machine shop), C. Powell, Purch. Agt.—lathe and mine hoist.

Okla., Picher—A. W. Jaeger—drill press and wood planer for blacksmith shop.

Okla., Picher—Picher Welding Co., W. Johnson, Purch. Agt.—emery wheel, stand, drill press and lathe (used).

Okla., Zineville—S. Alfrey—drill press, vise, hand tools and chain hoist for garage.

Pa., Carbondale—Hendrick Mfg. Co.—one 300 ton hydraulic press, also one geared press, Bliss 74½ B or similar.

Pa., East Pittsburgh — J. Pommersheim, Genl. Delivery—26 to 30 in. swing lathe.

Pa., Erie—Northern Equipment Co., V. V. Veenschoten, Purch. Agt.—24 in. New Era type vertical Bullard boring mill.

Pa., Harrisburg—Harrisburg Pipe & Pipe Bending Co., Herr St. near 10th St.—one hydraulic press, 4 column, 1,000 to 1,500 tons capacity, for piercing billets.

Pa., Hazleton — J. Schultz — complete garage and repair shop equipment.

Va., Lick Run—B. Thorman—drill press and bench tools for carpenter and blacksmith shop.

Va., Richmond—Grace St. Motor Co., 3 West Grace St.—drill press.

Va., Richmond—Harris & Hansel, 206 North Main St.—drill press and lathe for automobile repairs.

Va., Richmond—Harrison Auto Repair Co., 400 North Henry St.—lathe and drill press.

Va., Richmond—J. R. Layne, rear of 318 A West Grace St.—lathe, drill press and bench tools for automobile repair shop at Latonia, Fla.

W. Va., Wellsburg—Grotz Mould & Machine Wks. (glass house machinery), H. S. Grotz, Purch. Agt.—two engine lathes, 24 to 26 in. swing, from 8 to 10 ft. between centers, quick change gear preferred; one cylinder grinding machine for automobile cylinders; one horizontal hand press, for taking out armature shafts, 10 ft. long, armatures about 36 in. diameter; 16 in. back geared shaper (used preferred).

Wis., Antigo—Reed Bros.—drill press, boring machine, gasoline storage tank and pump for garage.

Wis., Janesville — Janesville Tool Mfg. Co.—special machinery and small tool room equipment for the manufacture of special tools and dies.

W's., Madison—Purcell-Bluteau Co., 434 West Gilman St. (repair shop)—heat treating furnaces and machine for grinding bearings.

Wis., Milwaukee — H. M. Eicholtz, 200 Pleasant St. (machinist)—one large turret lathe (used preferred).

Wis., Ripon—C. Kuehn—machine shop equipment, including drill press, lathe, small tools, etc., to replace that which was recently destroyed by fire.

Ont., Alfred—P. Laniel—drill press for garage.

Ont., Casselman—A. Sauve—machine shop equipment.

Ont., Cornwall—W. Seymour—automobile repair shop equipment.

Ont., Embrun—H. Peladeau—regrinding machine for garage.

Ont., Vankleek Hill—J. Harlsin, Main St. equipment for automobile repair shop.

Que., Arundel—J. Simon—drill press and shrinker for blacksmith shop.

Que., Montreal—J. D. Choquette, 1053 Cremane Blvd.—complete garage and automobile repair equipment, also gasoline tank.

Que., Montreal—Cylinder Grinding & Auto Parts Co., Ltd., 146 Mountain St.—emery wheel and small lathe.

Que., Montreal—N. Fortier, 125 Leclaire St.—complete equipment for garage and repair shop.

Que., Montreal—Garage Laramee, 664 Belanger St.—small—lathe and machine for regrinding.

Que., Montreal—E. Morrissette, 228 Marquette St.—complete equipment for automobile repair shop.

Que., Poltimore—J. Tomkiewitz—lathe for garage and blacksmith shop.

Que., Ste. Anne de la Perade—G. Guertin—automobile repair shop equipment.

Que., St. Barthelemi—C. A. Vincent—garage equipment.

Que., St. Casimir—T. Perron—automobile repair shop equipment.

Que., St. Stanislas de Champlain—A. Galipeau—small machine shop equipment.

Que., Sayabec — A. Levesque — garage equipment.

Machinery Wanted

Ill., Belvidere—Keene Belvidere Canning Co., H. K. Fanderberg, Purch. Agt.—canning and conveying machinery.

Ill., Chicago — Chicago & Northwestern R.R. Co., 226 West Jackson Blvd., F. J. Berck, Purch. Agt.—20 ton crane for shops at Madison, Wis.

Ill., Chicago—Howard Material Co., 79 West Monroe St.—machinery, including conveyors, crushers, sorters, etc., for gravel pit at Afton, Wis.

Ill., Chicago—Tuthill Bldg. Material Co., 131 West 63rd St.—one industrial crane.

Ill., Freeport—W. T. Rawleigh Co., 101 South Liberty St.—belting, shafting, etc., for proposed $100,000 power plant.

Ill., Rockford—Natl. Lock Co., 1930 7th St.—traveling crane.

Kan., Girard—W. L. Burket (cleaning plant)—DeVasher cleaner and extractor.

Kan., Osage City—J. Morse—5 x 8 in. Kesley printing press.

Md., Colgate (Baltimore P.O.)—Atlantic Sign Corp., 5th St. and Maxwell Ave.—steel shears, 52 in. wide, to cut metal 14 gage and heavier.

Mass., Boston—R. H. Wisbach Co., 1123 Commonwealth Ave. (manufacturer of automobile bodies)—wood and metal working equipment, including wood turning lathe, planer, matcher, saws, shears, drills, reamers, hacksaw, pulleys, belting and shafting, for new plant on North Beacon St.

Mass., Clinton—Clinton Carpet Co., F. Heathwood, Supt.—machinery for addition to plant.

Mass., Dorchester (Boston P. O.)—J. F. Williams, 143 Norfolk St.—10 x 15 in. Miller printing press and feeder (used).

Mass., East Braintree (Boston P. O.)—East Braintree Bleachery & Dye Wks., H. McCusker, Supt.—bleaching and dyeing machinery for proposed addition to plant.

Mass., East Cambridge (Boston P. O.)—Forge & Miller, 29 Otis St.—16 in. swing wood turning lathe (used).

Mich., Highland Park (Detroit P. O.)—Ford Motor Co.—mechanical equipment for handling parts and assembling automobiles for proposed plant at Dallas, Tex.

Mich., Iron Mountain—Ford Motor Co., E. G. Kingsford, Mgr.—woodworking machinery, including boring machines, mortiser, planer, bandsaw and circle saw, for the manufacture of automobile bodies.

Mich., Iron Mountain—School Bd., E. P. Eilertson, Clk.—wood turning lathes, bandsaw, sanders, planer, bench tools and benches.

Miss., Macon—County Supervisors, J. A. Tyson, Clk.—hammer for 1,500 hp. pile driver.

Mo., Joplin—Busy Bee Shoe Shop, 307 Joplin St., P. K. Davis, Purch. Agt.—dust collector for shoe finishing machine.

Mo., Joplin—Jest-A-Mere Print Shop, 1220 Main St., R. H. Biddle, Purch. Agt.—job printing press.

Mo., Kansas City—Ben Franklin Press, 805 Oak St., J. D. Howard, Purch. Agt.—14 x 22 in. Colts job printing press.

Mo., Kansas City—Peet Bros. Mfg. Co., 17th and Kansas Sts. (soap)—machinery and equipment to enlarge plant.

Mo., St. Louis—J. Kickham Boiler Wks., 815 South Bway.—emery wheel with motor.

Mo., St. Louis—Monsanto Chemical Co., 1701 South 2nd St.—one iron slush plate and frame or recessed filter press, 30 in. with closed delivery, equipped for thorough washing, press with 30 chambers, making 2 in. cakes preferred.

N. Y., Batavia—Batavia Iron Wks., Clinton St., F. W. Allen, Treas.—machinery for the manufacture of iron and steel parts for cars, etc.

N. Y., Buffalo—De Long & Wenrich, 204 Chester St.—equipment for bakery.

N. Y., Buffalo—E. E. Lipp, 996 Genesee St.—equipment for proposed laundry.

N. Y., Buffalo—Trico Products Co., 624 Ellicott St., J. Oisher, Mgr.—equipment for the manufacture of metal stampings and automobile accessories.

N. Y., Buffalo—Vneeda Woodworking Co., 806 Jefferson Ave.—machinery for cabinet work, also for the manufacture and repair of furniture.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—Pig-iron stocks accumulating; market weak. Iron and steel scrap adversely affected by weakness in pig iron. Fair volume of new buying in fabricated structural steel, particularly for schools and commercial buildings. Plate demand somewhat slower. Prices hold firmly to the $2.50 base for plates and shapes; bars, $2.40 per 100 lb., f.o.b. Pittsburgh.

Declines—Prices tendency downward in non-ferrous metals. Tin weaker; lead quiet. Dullness gradually forcing zinc prices downward. Copper, however, shows indications of a stronger tone.

No advances reported.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$28.05
Northern Basic	25@26
Southern Ohio No. 2	26.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	31.00
BIRMINGHAM	
No. 2 Foundry	24.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	26.75
Virginia No. 2	30.17
Basic	26.00
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	27.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	26.90
Basic	26.90
Bessemer	27.90

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.00@5.50

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	5.05
Nos. 22 and 24.	3.75	5.00	4.50	5.05
Nos. 25 and 26.	3.80	5.05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20
Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00	5.15	4.70	5.35
Nos. 12 and 14.	4.10	5.25	4.80	5.45
Nos. 17 and 21.	4.40	5.55	5.10	5.75
Nos. 22 and 24.	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
BUTT WELD					
1 to 3	62	50½	⅜ to 1¼	30	13
LAP WELD					
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	28	13
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	60	49½	⅜	28	12
2 and 3	61	50½	1 to 1½	30	14
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ¼-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
¼	$0.09	50%	⅞	$0.16	35%
⅜	.11	45%	1	.18	31%
½	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.65	3.90	4.55
Cold finished flats, squares	5.15	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 5/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.00
Tin, 5-ton lots, New York			42.25
Lead (up to carlots), St. Louis	6.75	New York	7.50
Zinc (up to carlots), St. Louis	6.40	New York	6.87½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	27.00	25.50
Antimony (Chinese), ton spot	8.35	10.50	7.50
Copper sheets, base	21.75	22.00	23.00
Copper wire, base	16.00	19.25	16.25
Copper bars, base	20.25	22.50	19.50
Copper tubing, base	24.50	27.50	23.00
Brass sheets, base	18.00	23.00	18.75
Brass tubing, base	23.00	28.50	20.50
Brass rods, base	15.75	18.50	15.75
Brass wire, base	18.50	23.00	.....
Zinc sheets (casks)	10.25	10.45	.....
Solder (½ and ½), (case lots)	29.50	27.75	20.00
Babbitt metal (83% tin)	52.00	53.00	40.00
Babbitt metal (35% tin)	25.00	17.00	17.00
Nickel (ingot and shot)	29.00	.....	35.00
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.75	12.00
Copper, heavy, and wire	11.25	11.25	11.25
Copper, light, and bottoms	9.50	9.25	10.25
Lead, heavy	5.75	5.50	5.75
Lead, tea	4.75	4.25	4.75
Brass, heavy, yellow	7.00	....	7.25
Brass, heavy, red	9.50	9.50	9.00
Brass, light	5.50	5.25	6.50
No. 1 yellow brass turnings	6.50	6.00	7.00
Zinc	3.75	3.00	4.00

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$19.50	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	17.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	12.60	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13½x13½, per lb.	11.00	36.00 per M	.10
Wiping cloths, 13½x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.95	1.06	1.14
White lead, dry or in oil	100 lb. kegs.	New York,	14.00
Red lead, dry	100 lb. kegs.	New York,	14.00
Red lead, in oil	100 lb. kegs.	New York,	15.50
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.25@4.75	
Coke, prompt foundry, Connellsville	per net ton	5.25@5.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40-10%	50-10%	45-5%
1½ and 1½x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	25-10%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30-10%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	40-10%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30-10%	45%	40-5%
Bolt ends, with hot pressed nuts	40-10%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, ⅜ and smaller	60%	.....	....
Semi-finished nuts, ½ and larger	55%	65-10%	80%
Case-hardened nuts	40%	....	.....
Washers, cast iron, ⅛ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ¼ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	0.50	2.75	2.50
Rivets:			
Rivets, ⅜ in. dia. and smaller	50-10%	50-10%	60%
Rivets, tinned	50-10%	50-10%	4½c. net
Button heads ⅜-in., ½-in., 1x2 in. to 5 in., per 100 lb (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1½ to 1½-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅜ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30-10%	30-10%	30-10%
Heavy grade	20-5-2½	30%	20-5-2½%
Rubber and duck:			
First grade	50-10-5%	50-10%	40-10%
Second grade	60-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20

N. Y., Caledonia—Brayer Basket Plant, N. L. Brayer, Purch. Agt.—machinery and equipment for the manufacture of baskets.

N. Y., Canisteo—Dairymen's League, B. Whiteman, Pres.—equipment for proposed $40,000 shipping station.

N. Y., Fredonia—Fredonia Steam Laundry Co.—equipment, to replace that which was destroyed by fire.

N. Y., Geneva—Premier Mill Corp., S. K. Nester, Jr., Purch. Agt. special machinery for the manufacture of a grinding device to reduce solids to filter paper fineness.

N. Y., Horseheads—C. Evendon—equipment for cider mill and garage, to replace that which was destroyed by fire.

N. Y., Jamestown—Industrial Wet Wash Laundry, 300 Steel St., J. Blagbrough, Purch. Agt.—equipment for proposed addition to plant.

N. Y., Jamestown—Jenkins & Carlson, Arcade Bldg., North Main St., H. P. Lintner, Treas.—job printing equipment.

N. Y., Niagara Falls—Ryder Mfg. Co., S. M. Ryder, Purch. Agt.—machinery for small plant for the manufacture of specialties, to replace that which was destroyed by fire.

N. Y., North Tonawanda—Bilt Rock Board Corp., E. R. Maltby, Pres.—machinery and equipment for the manufacture of patent wall board.

N. C., Burlington—Queen Anne Textile Co., W. H. Morton, Adams, Mass., Pres.—equipment for proposed $1,000,000 cotton mill.

N. C., Winston-Salem—S. C. Park, et al.—grinding, screening machinery, etc., for proposed $75,000 mica mill.

O., Akron—Anaconda Copper Mining Co.—machinery and equipment, including furnaces, for proposed $500,000 factory unit at Bettes Corners.

O., Bellefontaine—C. A. Willis Ice Cream Co.—equipment for the manufacture of ice cream.

O., Dayton—Dayton Veneer Co., 700 South Bway, J. W. Frye, Pres.—woodworking machinery to enlarge plant.

O., Toledo—Sunshine Baking Co., 1905 Canton St.—equipment to replace that which was recently destroyed by fire.

Okla., Devol—M. L. McClure—newspaper press and equipment.

Okla., Marlow—J. C. Nance—paper cutter and job press, both Chandler & Price make; linotype and Miller feeder.

Okla., Tulsa—Tulsa Cotton Mills Co., D. Hunt, Pres.—textile machinery, including 18,000 spindles, 750 automatic looms, dyeing machinery and finishing equipment.

Pa., Johnstown—Lorain Steel Co.—two heavy frog and switch planers.

Pa., Lehighton—Carbon County Advocate—presses and equipment, to replace that which was destroyed by fire.

R. I., Shannock—Columbia Narrow Fabric Co.—machinery and equipment for new weave shop.

R. I., Woonsocket—Jules Desurmont Worsted Co., Water St.—picking, carding and spinning machinery for addition to plant.

Tenn., Johnson City—Amer. Phalanx—linotype machine, cylinder press and job press.

Tenn., Memphis—Purity Oil Co., Monroe Ave., E. H. Cannon, Purch. Agt.—machinery and equipment for oil station

Va., Blackstone — Nottoway Shook Co., Inc.—planer and circular saw for woodworking plant.

Va., Portsmouth—Southern Brake Shoe Co.—machinery and equipment for proposed brake-shoe foundry.

W. Va., Hinton—Hinton Silk Mills—machinery to equip silk mill.

Wis., Antigo—Langlade County Lumber Co., c/o R. C. Dempsey—bandsaw, rip and cross cut saws.

Wis., Appleton—Riverside Fibre & Paper Co.—special paper machines, belting, etc., for new finishing mill.

Wis., Beaver Dam—Wadhams Oil Co., A. O. Vinz, Mgr.—gasoline storage tanks and pumps for filling station.

Wis., Independence—Independence Tobacco Warehouse Corp., J. A. Markham, Pres.—conveyors, etc., for proposed warehouse.

Wis., Madison—W. S. Bradley, 315 North St.—machinery and equipment, including dryers, for new wet wash laundry at 6 North Charter St.

Wis., Madison—Mead & Seastone, Journal Bldg.—15 ton hand operated traveling crane for power plant at Caldron Falls.

Wis., Madison—C. T. Rieder, 635 University Ave.—large tire vulcanizer, air compressor and free air equipment for tire repair shop.

Wis., Milwaukee—Milwaukee Coke & Gas Co., 187 Greenfield Ave., A. Bruens, Supt.—special machinery and equipment for proposed $50,000 benzol plant.

Wis., Racine—B. Lawson, 401 Lake Ave.—emery wheels, stands, electric drilling machine and one air compressor.

Wis., Rio Creek — Rio Creek Builders' Veneer & Woodwork Co., M. Bank, Pres.—veneer press, planer, sticker, mortiser and sander for proposed $40,000 factory.

Wis., Ripon — H. H. Tucker — canning machinery, including cookers, sealers, conveyors, etc.

Wis., Sheboygan — Danish Pride Milk Products Co., 608 North 8th St.—milk canning machinery, testers, sterilizers, etc., for proposed $55,000 condensery at Cashton.

Wis., Sheboygan—Phoenix Chair Co., Virginia and South 11th Sts.—equipment for new curing kiln.

Wis., Stratford—Stratford Canning Co.—canning machinery, conveyors, belting, shafting, etc., for proposed $45,000 plant.

Ont., Alfred—S. Bourgeois—blacksmith shop equipment.

Ont., Arnprior—A. F. Campbell & Son—planing mill equipment.

Ont., Cornwall—Atchison & Co.—planing mill machinery.

Ont., Cornwall—Fallow Bros., Water St., A. Fallow, Purch. Agt.—polishing and cutting machinery and tools for marble works.

Ont., Fournier — P. Tranchemontagne (manufacturer of carriages)—woodworking machinery.

Ont., Gowganda—Castle-Tretheway Mines, Ltd., M. D. Kennedy, Mgr.—complete milling plant.

Ont., Merritton—Garden City Paper Co.—complete equipment for proposed $400,000 paper mill at St. Catherines.

Ont., Pembroke—B. E. Eggert, 365 Christie St.—forge, anvil, etc., for blacksmith shop.

Ont., Renfrew—J. Donahue—blacksmith shop equipment.

Ont., Toronto—West Dome Consolidated Mines, Ltd., H. O. Pellatt Bldg., Bay St.—machine drillers for underground work for mines at South Porcupine.

Que., Lac des Ecorces—R. Painchaud—sawmill machinery.

Que., Lachute—J. Simon—blacksmith shop equipment.

Que., Mica—Mica Mine, J. B. Lalonde, Purch. Agt. — hammers, drill and air compressor.

Que., Mont Laurier—R. Demers—puncher, vise, emery wheel, etc., for garage.

Que., Montmagny—A. Belanger, Ltd., C. Belanger, Purch. Agt.—machinery for the manufacture of stoves.

Que., Montreal—Globe Printing Press, 124 St. Paul St., W.—presses and paper cutter.

Que., Quebec—Canadian Dirigible Headlight System, Ltd., c/o W. Stoleo, 3 Aberdeen Ave.—machinery for the manufacture of articles and devices for steam and electric railways.

Que., Quebec—J. V. Dore, 260 St. Helene St.—blacksmith shop equipment.

Que., St. Ours—G. Chapdelaine—general equipment for blacksmith shop.

Metal Working Shops

Calif., Bakersfield—The trustees of Kern County Union High School Dist. will receive bids until Oct. 15 for the construction of shop buildings. C. H. Biggar, Bank of Italy Bldg., Bakersfield, Archt.

Me., Bar Harbor—The Bureau of Yards & Docks, Navy Dept., Wash., D. C., will receive bids until Oct. 10 for the construction of a garage, also repairs to administration building for Radio Station, here.

Mich., Detroit—A. Kahn, Archt., 1000 Marquette Bldg., is receiving bids for the construction of a 1 story, 193 x 208 ft. foundry and warehouse for the Great Western Smelting & Refining Co., Russell St.

N. Y., Brooklyn—The 83rd St. Constr. Co., c/o H. A. Weinstein, Archt., 375 Fulton St., will build a 1 story garage on Cedar Pl. Estimated cost $50,000.

O., Cleveland—The Gabriel Mfg. Co., 1407 East 40th St., manufacturer of automobile bumpers, has had plans prepared for the construction of a 2 story, 80 x 150 ft. factory. Estimated cost $60,000. C. Foster, Mgr. H. E. Shimmin, 2031 Euclid Ave., Archt.

O., Cleveland—I. G. Kohn, 640 Guardian Bldg., awarded the contract for the construction of a 1 and 2 story, 60 x 126 ft. garage and commercial building at 2027 East 105th St. Estimated cost $50,000. Noted Sept. 13.

Pa., Ambridge—The Standard Seamless Tube Co. is receiving bids for the construction of a 1 story, 80 x 500 ft. and 20 x 80 ft. addition to mill building. Private plans. Noted Aug. 24, 1922.

Pa., Bustleton (Philadelphia P. O.)—The R. A. Erwin Motor Co., Bustleton and Welsh Rds., will soon award the contract for the construction of a 1 story, 80 x 184 ft. garage. Estimated cost $35,000. C. H. Fries, 8239 D St., Fox Chase, Phila., Archt.

Pa., Clearfield—W. B. Holmesk, Jr., is having plans prepared for the construction of a 2 story, 50 x 100 ft. garage on Merrill and Williams Sts. Estimated cost $40,000. Private plans. Noted Apr. 5.

Pa., McKeesport—The Peters Packing Co., 922 Rose St., is having plans prepared for the construction of a 6 story, 25 x 70 ft. garage and addition to packing plant. Estimated cost $175,000. C. Stattler, Weehawken, N. J., Engr.

Pa., Oil City—The Reimann Co., 5 East Front St., will build and award separate contracts for the construction of a 2 story, 136 x 198 ft. garage. Estimated cost $65,000.

Pa., Pittsburgh—J. B. Dwyer, Archt., Forbes Murray Bldg., will build and award separate contracts for the construction of a 1 story, 60 x 180 ft. garage on Forbes St. for A. J. Diebold, 5621 Aylesboro Ave. Estimated cost $40,000.

Pa., Pittsburgh—The Pittsburgh Malleable Iron Co., 34th and Smallman Sts., awarded the contract for the construction of a 1 story, 95 x 260 ft. mill building. Estimated cost $50,000.

Pa., Wilkes-Barre — V. Purdsminici, 86 Seneca St., awarded the contract for the construction of a 2 story, 20 x 40 ft. garage and service station.

Tenn., Memphis — F. J. Rice is having plans prepared for the construction of a 77 x 146 ft. showroom, parts and repair shop, etc., on Butler St. between 2nd and 3rd Sts. Estimated cost $25,000. Mahan & Broadwell, American Bank Bldg., Memphis, Archts. Halloran-McLean Tractor Co., 650 Marshall St., lessee.

Va., Richmond—Davis Bros., Inc., 2510 West Main St., are having plans prepared for the construction of a 1 story, 75 x 170 ft. garage on Marshall and Clay Sts. Estimated cost $15,000. Private plans.

Wash., Hillyard (Spokane P. O.)—The Western Fruit Express Co., 1505 Pioneer Bldg., St. Paul, Minn., is having plans prepared for the construction of a repair shop for refrigerator cars, here. Estimated cost $150,000. F. G. Luth, Mechanical Supt. Private plans.

Wis., Manitowoc—The E. W. Krug Mfg. Co., 918 South 19th St., awarded the contract for the construction of a 1 story, 80 x 90 ft. machine and repair shop.

Wis., Mondovi—W. Hardy will receive new bids late this fall for the construction of a 2 story, 40 x 100 ft. garage. Estimated cost $40,000. Private plans. Former bids rejected.

Wis., Plymouth—The Plymouth Phonograph Co. plans to build a 2 story, 60 x 160 ft. factory. Estimated cost $60,000. F. D. McIntyre, Secy. Engineer or architect not selected.

Wis., Poskin—The D. & H. Sure Grip Brake Co. plans to build a 2 story, 60 x 90 ft. factory for the manufacture of brakes for Ford cars. Estimated cost $50,000. A. Delegard, Mgr. Engineer or architect not selected.

See the SEARCHLIGHT SECTION *Pages* 128-137